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MISSING MARKETS IN WORLD TRADE
THE CASE FOR 'SUI GENERIS' PROTECTION OF TRADITIONAL KNOWLEDGE

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Foreword

The feasibility of 'sui generis' protection of traditional knowledge is a matter of considerable interest to developing countries because of its trade potential. It concerns all countries regarding costs and benefits of appropriation of traditional knowledge in the absence of access and benefit-sharing regimes. WTO's Doha Ministerial Declaration referred the matter to the TRIPS Council where discussions have begun but not yet concluded. In 2001, WIPO instituted an Inter-Governmental Committee on Traditional Knowledge, Genetic Resources and Folklore which whose mandate has recently been extended. The question of examining feasibility of national or international '*sui generis'* protection of traditional knowledge in a manner consistent with international treaty obligations involves complex policy choices concerning the application of law and economics to problems with multi-disciplinary dimensions.

This study was undertaken as part of the WTO series of studies at ICRIER supported by the Sir Ratan Tata Trust. The study analyses the problem from an inter-disciplinary perspective and concludes by presenting a framework for national '*sui generis'* protection of traditional knowledge. The study first constructs a taxonomy, taking into consideration the special features and characteristics of how different forms of traditional knowledge are held and transmitted by knowers and users from the perspective of what is knowable, by whom, and how. The study then analyses the scope, efficiency in application, equity in outcomes, and compatibility with other international regimes of the world's intellectual property rights system, in its protection of traditional knowledge.

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Abstract

This study analyses the feasibility of 'sui generis' protection of traditional knowledge as a Scitovskyian problem of 'missing markets' in world trade in the context of the reference made by the WTO Doha Ministerial Declaration to the TRIPS Council. The logic and design for a national framework of sui generis protection of traditional knowledge and plant genetic resources that can harmonise development priorities with all international commitments, including TRIPS, is developed and presented.

The study constructs a taxonomy taking into consideration the special features and characteristics of how different forms of traditional knowledge are held and transmitted by knowers and users from the perspective of what is knowable, by whom, and how. The study finds that considerable ownable knowledge claimed under intellectual property rights arises from the combination of folklore, genetic resources, and traditional knowledge, with technology playing an important function as an interlocutor. The location of traditional knowledge in articulable and tacit forms within and without arenas of contestation influences what is protectable from what is in the public domain. The study analyses how and why and in what respects, the world's intellectual property rights system is incomplete in scope, inefficient in application, inequitable in terms of outcomes, and incompatible with other international regimes. The profound implications under-use and exhaustability have for inter-generational and spatial equity are discussed to examine whether traditional knowledge has characteristics of public goods to clearly establish undesirable conditions under which non-excludability, and non-rivalrous consumption are not met.

Depending on whether traditional knowledge is to be treated as a pure or impure public good, the economics of valuation of traditional knowledge is analysed by admitting two orders of static effects and three orders of dynamic effects and how policies designed to maximise early positive gains from static effects may be counter-productive in terms of cancelling the dynamic effects, which ought to be much greater than the static effects, if chronology and institutional intervention are factored into the calculus.

Distributed cross-border value-chains in which multinational companies (MNCs) participate are an important feature of the biopharmaceutical industry. The absence of intellectual property rights to ideas cared and fed where organic and informational resources are inextricably intertwined have baffled lawyers ever since the TRIPS agreement The economics of innovation and exhaustible natural resources in missing markets have also puzzled economists for a long time, since informal cross-border spill-overs in such missing markets are an endemic feature.

The opportunities for linking access regimes with benefit-sharing arrangements to respond to bioprospecting and the corresponding challenges of biopiracy are analysed to present an overarching case for state intervention to benefit from the General Agreement on Trade in Services (GATS) which reinforces knowledge creation as the outcome not

only of scientific beliefs but also of justifiable experiential insights. Patentability under TRIPS does not require disclosure of origin or prior informed consent from where organic and informational resources are procured. The thresholds of novelty and inventive steps vary in different countries. The very purpose of rewarding the care and feeding of ideas for which the intellectual property system exists is defeated if those who nurture 'ideas' cannot share in benefits from the development of their traditional knowledge. The study finds that norms of disclosure in biotechnology patents, the quid pro quo to protection of innovation, are of limited benefit to practitioners and researchers for further innovation in developing countries deficient in access to technologies and patentable life-forms such as genetically modified micro-organisms.

The study notes the limitations of desirable defensive measures such as digitalisation of traditional knowledge, which are necessary, but are not sufficient and evaluates policy choices at national and international level with reference to experiences in India and other countries, and prevailing international treaties. The study highlights that valuation of intangible assets holds the key to structuring access and benefit sharing arrangements for local communities that care for traditional knowledge. Such valuation is crucial also for cross-border high-tech developers so that the problem of ` under-use' or ` plucked to extinction' can both be avoided.

Keywords: WTO, TRIPS, IPRs, Missing Markets, Traditional Knowledge, Sui generis protection, Intangible assets, Genetic Resources, Biotechnology.

Missing Markets in World Trade
The Case for 'Sui Generis' Protection of Traditional Knowledge[1]

By Ajeet Mathur

1. Introduction

This study is a sequel to 'Who Owns Traditional Knowledge ?' (Mathur, 2003a). In the previous study, I analysed the logic of competing claims and contestations to specify the universe of problems concerning assignment of intellectual property rights (IPRs) to traditional knowledge and genetic resources.Here, I analyse the case for protection of traditional knowledge as a Scitovskyian problem of pecuniary external economies in missing markets, involving investment allocation decisions. I conclude by proposing national *'sui generis*' protection frameworks designed to harmonise national priorities together with compliance with all international agreements, including, but not limited to, WTO and TRIPS.

Traditional Knowledge (TK) plays an important role in the world economy because a wide range of medicinal plants, herbal formulations, and products based on agriculture, forestry, arts and crafts are traded internationally and have considerable economic value. TK is also used as an input into modern industries such as biopharmaceuticals, cosmetics, dyes, pigments, chemicals, textiles, design, pesticides, farming and agro-industries, to mention a few. A large proportion of this value added is captured by companies leveraging their scientific and technological capabilities through trade using worldwide marketing networks.

An international consensus on the scope of IPR protection for TK remains elusive. Criteria for coverage and the terms of protection for TK are neither free from controversy, nor imminent. Thus, there is a need to examine the feasibility of *'sui*

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[1] *This is a revised version of the study presented at the seminar 'Missing Markets in the World Trading System:The Case for Sui Generis Protection of Traditional Knowledge' , October 30, 2003, organised by the Indian Council for Research on International Economic Relations, New Delhi. I am grateful for insightful comments and useful suggestions received from Arvind Virmani, Risto Nuolimaa, Shankar Acharya, Anwar Hoda and Mrinal Datta Chaudhuri at different stages of this work. The technical assistance of Eeva Rintala, Jitender Sachdeva and Ankush Kakkar towards preparation of this manuscript is appreciated.* *Email: ajeet.mathur@uta.fi*

generis'[2] protection of traditional knowledge. This is explicitly acknowledged in paragraph 19 of the Doha Ministerial Declaration as one of the important issues to be discussed by the TRIPS Council during the current round of WTO negotiations.

If TRIPS is clarified or revised and supplemented to cater to protection of traditional knowledge, or if the WIPO Inter Governmental Committee on traditional knowledge, genetic resources (GR) and folklore, with its renewed mandate of September 2003, succeeds in securing commitments towards an international treaty, a way forward may be established for international consensus on protecting, developing and trading in traditional knowledge. Meanwhile, a number of countries including Brazil, China, India, Panama, Peru, Philippines, Portugal and the African Union countries have taken steps towards the design and development of national '*sui generis'* protection systems for traditional knowledge.

In the context encapsulated above, policy questions and decisions on policy choices in the design and modalities of national 'sui generis' systems have gained significance and assumed urgency.

There is no universally recognised definition of ' traditional knowledge' (TK). Conventionally, the notion covers indigenous knowledge, folklore, traditional medicinal knowledge etc. TK may be contemporary or non-contemporary and is not necessarily ancient or antiquated. There are many kinds of TK and some of them are of more immediate interest than others in specific countries. Also, TK manifests in a variety of forms. There are differences in ways countries choose to protect traditional knowledge based on their diversity of traditions, cultures, socio-economic circumstances and legal frameworks. Country experiences of TK protection influence and contribute to the evolution of international standards and agreements on the subject. Diversity and plurality can be enriching sources for cross-fertilisation of experiences, but competing models also present obstacles towards convergence.

[2] *' sui generis' connotes unique, distinctive, constituting a class of its own.*

There is no scarcity of TK in the world. Yet, it is under-supplied and under-used. TK frequently comes bundled with natural resources which are scarce, over-exploited and exhaustible. Thus, organic and informational aspects co-exist. The knowledge component in product-services linkages is usually of greater value than the commodified goods in a marketable bundle. Poor people in developing countries inhabit locations with vast resources of traditional knowledge and plant genetic resources. The magnitude of resources held by, and cared for by people living in conditions of chronic poverty is unknown but certainly more than anyone has ever understood. To some extent the resources are in use as a means by which the poor sustain themselves in non-monetized exchanges and reciprocity-based relations. However, the poor are constrained in developing products and services from these resources for markets or trading in these resources because:

(a) Investments are inhibited by the absence of titles to formal rights to develop such resources or trade in them, or provide access to them under benefit-sharing contracts.

(b) Asymmetric information regarding the emergent value of such resources, once developed, constrains transactions and contracts, further limiting their development due to non-availability of capital and technologies.

(c) There is an inadequacy of incentives to make 'learning by doing' possible on a scale that could enhance the value and use of such resources by creating new markets.

At first glance, this seems strange. Knowledge creation (based on scientific beliefs or experiential insights or both) is a driver of competitiveness. Competitiveness in international value chains has rendered all relevant factors of production mobile or linkable, requiring managerial productivity to be redefined in knowledge creation terms[3].

[3] *See Mathur (1990) and Nonaka (1992) for the paradigm shift evidenced in the 17-country empirical study undertaken as a collaborative venture by National Experts on Managerial Productivity in which the author of this study collaborated with Ikujiro Nonaka to conceptualise managerial productivity as knowledge creation.*

The General Agreement on Trade in Services (GATS) reinforces this trend. So why is a part of the world's knowledge resource pool lying untapped ?

There are two opposing forces at work.

Enterprises seek to promote resource flows and factor mobility. Multi-National Companies (MNCs) are the acknowledged engines of cross-border enterprising and drivers of competitiveness. Distributed cross-border value-addition processes are well reflected in value chains in which (MNCs) participate. One of their important functions is to link resources unmediated by market transactions, through the facilitation of centripetal forces.

In contrast, regions and localities seek to develop and link distinctive advantages sustainable at their locations that endear the location to mobile capital in search of returns. Locations compete to attract investments by making some factors of production less mobile, by offering and developing distinctive location-bound advantages through direct interventions as actors, with public subsidies, through investments, by offering preferential government procurement and other incentives. Traditional knowledge comprises local knowledge clustered at a location in articulated and tacit forms and can be a source of distinctive advantage. Thus, there are centrifugal forces at work too.

It is therefore particularly intriguing when certain kinds of knowledge sharing and knowledge transfers of economic value are neither mediated by the market nor by the State. There could be instances where centripetal forces no matter how efficient are not effective and the centrifugal forces no matter how justified also appear to lack the powerbase to pursue justifiable intent.

The absence of intellectual property rights to ideas cared for and fed in contexts where organic and informational resources are inextricably intertwined (as is the case with traditional knowledge and plant genetic resources), have baffled lawyers ever since the TRIPS agreement became effective on January 1, 1995. Legal experts the world over

have regarded the design of '*sui generis'* protection of traditional knowledge as desirable. However, contracts of rights and obligations in respect of traditional knowledge have proved difficult to construct. The problem is particularly severe in the subset traditional medicinal knowledge due to unclarity in valuation of traditional knowledge and plant genetic resources and the uncertainties regarding enforceability of a special category of property rights.

The economics of innovation and exhaustible natural resources have also puzzled economists for a long time. Informal cross-border spill-overs in missing markets are an endemic feature when borders are porous. When intermediation among economic agents is not mediated through market transactions, it is customary to consider state intervention, however transitory, as a policy measure. A government may also limit its role to facilitate the mitigation of information asymmetry and solve problems with contract enforcement, letting the hidden hand of the market do the rest.

Occasionally, there exist special cases where it is not possible to visualise the problem in terms of only these two infirmities and the ' visible hand' of policy is necessary. Pecuniary externalities can be economy-wide with no agreement on the nature and form of these services and disservices or even on why they are not priced by the market (Scitiovsky, 1954)[4]. Market prices reflect the situation as it is and not as it could be. The form of a resource can itself be the source of externalities, besides informational externalities induced by moral hazards and adverse selection. Moreover, thin or missing markets can persist for long periods of time (Greenwald and Stiglitz, 1986). In the case of common property resources, only access and use can resolve externalities, and informal side-trading is a signal of that prospect but such trading does not create futures markets. The problem of thin or missing markets is distinguishable from problems of transactions costs because information asymmetries exist before any potential transaction and persist after a real one. Critiques of Greenwald-Stiglitz question the notion of asymmetry between

[4] *Scitovsky pointed to the role of intellectual property rights as a necessary precursor to market-intermediated transactions, complementary to scarce technological external economies but assumed that patents would adequately fill the void in markets for innovation.*

enforcement capacities of the State and market forces (Mookherjee, 2003) in a quest for sharper specification of conditions under which State intervention is more effective than markets.

An overarching case for state intervention exists when extreme inequality characterises the transactions where pecuniary external economies of a Scitovskyian kind are present and strongly affected by technology and scale effects. The need for policy intervention is greater when network externalities for pure public goods exhibit non-convex production and revenue functions due to increasing returns caused by technology standards and innovations based on science and technology (Datta-Chaudhuri,1990; Mookherjee, 2003, p.130). The market for traditional knowledge and plant genetic resources is precisely such a case. Here, government failure can be a more worrisome problem than market failure[5]. National and international priorities may conflict and lead to different solutions if international pecuniary external economies are not addressed in national policy choices. The problem acquires new dimensions of complexity when cross-border spill-over effects of missing markets require interventions without disturbing the harmony of national policies with international regimes when nations compete with each other in the arenas between national governance policies and international economic relations (Mathur, 2003c).

The critical question is how actors faced with thin or missing markets handle flows of resources when it does not pay to invest in just a little of it (Radner and Stiglitz, 1984). Building reputation and credibility in a resource is the principle means of resolving problems of asymmetric information in thin or missing markets (Akerlof, 1970). However, this is impossible without recognising that the resource has a certified value and rightful claimants have authority to license or sell it. Moreover, since the notion of property connotes a specific relationship between a thing and a person, TK property rights are not easily established, and the cost of enforcement of any kinds of rights or claims for benefit-sharing arrangements are prohibitive.

[5] *For a lucid exposition of a new development paradigm that develops this in the larger context of general applicability, see Virmani (2002).*

Patentability under TRIPS does not require prior informed consent of countries or communities from where organic and informational resources are procured. The thresholds of novelty and inventive steps vary in different countries. 'Prior art' and public domain status are either too easily assumed or never established because traditional knowledge is created over a period of time, and it may be individually or collectively held and is largely orally transmitted within communities in traditions and languages unfamiliar or inaccessible to patent offices. The very purpose of rewarding the care and feeding of ideas for which the intellectual property system exists is defeated if those who nurture 'ideas' cannot participate in benefit streams that arise from the global development of trade and investments. Out of 762 randomly selected new US medicinal patents under A61K35/78 and other IPC classes scrutinised in a study in 2000, as many as 374 patents were found to be based on traditional knowledge (Mashelkar, 2001). Between March 2000 and April 2003, "*unauthorised use of Indian TK or misappropriation in the area of medicinal plants may be to the extent of more than seven thousand patents granted for unpatentable TK innovation in three patent offices alone*" (WIPO, 2003, p.41) [6].

Genetic resources have taken on increasing economic, scientific and commercial value for a wide range of stakeholders. Traditional knowledge associated with such resources attracts worldwide attention. Tradition-based creations have demonstrated a new economic and cultural potential due to the explosion of multimedia. Studies have found that trade in goods and services from the use and development of traditional knowledge is growing at over 30 percent per year in some segments such as herbal medicine,

[6] The challenge mounted to contest *neem*, *haldi* and *basmati* patents ignited public ire and consciousness but the majority of such biopiracy patents for the same uses as in Indian traditional knowledge have never been challenged. These include patents on *Bel* (*Aegle marmelos*) for treating diabetes, *Ghritakumari* (*Aloe vera*) for skin and hair disorders, *Guggul* (*Commifora mukul*) for hyperlipidemia and skin diseases, *Haldi (turmeric or curcuma longa)* for jaundice and hepatic disorders, *Kalajira* (*Nigella sativa*) for dental care, hepatitis and chapped skin, A*mla* (*Emblica officinalis*) for grey hair dyeing and cosmetics, K*alimirch* (*piper nigrum*) for arthritis, C*handrabhaga (Rauwolfia Serpentina)* for heart diseases, M*anjishtha* (*Rubia Cordifolia*) for paralysis, I*mli* (*Tamarindus Indica*) for anti-inflammatory action, Ashwagandha *(Withania somnifera)* for rheumatism, Arjuna *(Terminalia arjuna) for* high blood pressure, *Harra (Terminalia chebula)* and *Bahera (Terminalia bellerica)* for ulcers and gastritis, etc. India is not the only country to have so suffered. Peru's *Maca* plant (*Lepidium Meyenii*) was patented for its well-known properties in the treatment of sexual dysfunction and infertility. Thousands of such examples can be found all over the world.

nutraceuticals, cosmetics, artisanal crafts and medicinal drugs. Traditional knowledge for healthcare products development is the segment in greatest demand. Rights to patented medicinal drugs have a worldwide market. Also, awareness of alternative systems of medicine is growing. The problem may be viewed at its acutest in the case of traditional medicinal knowledge where missing markets for access to genetic resources and indigenous knowledge under benefit sharing arrangements fuel strong incentives for bioinformatics, bioprospecting, and biopiracy. Cross-border value chains are already functioning on an unprecedented scale in a bid to discover, develop and trade in new active ingredients sourced from traditional medicine. As early as 1990, plant based medicines were estimated to be a $61 billion business worldwide (Farnsworth, 1990).

Norms of disclosure in biotechnology patents, the *quid pro quo* to protection of innovation, are of limited benefit to practitioners and researchers for enabling further innovation in developing countries. The deposit of a genetically modified specimen is often a part of the patent disclosure. Countries deficient in access to technologies and depositories of patentable life-forms (such as genetically modified micro-organisms) get practically nothing in return for surreptitious use of TK in patented medicines.

Trade gains and welfare losses from trade in services are not easily measured because assumptions made and models used can yield very different results for the same bundle. But at least one thing is clear. Markets with serious information imperfections would not be pareto-efficient even if the cost of obtaining information are ignored. The welfare properties of the conventional Arrow-Debreu-Mckenzie market model are lost when markets are incomplete (Hahn,1971; Grossman and Hart,1983).

The universe of traditional knowledge is greater than the subset comprising traditional medicinal knowledge. Different forms in which traditional knowledge is found, cared for and transmitted requires a robust taxonomy of traditional knowledge to be conceived. In the following section (Section 2) of this study, I construct such a taxonomy, taking into consideration the special features and characteristics of how different forms of traditional

knowledge are held and transmitted by knowers and users from the perspective of what is knowable, by whom, and how.

A traditional knowledge taxonomy must cater to the range of human creative, affective and cognitive endeavour. It must have space for knowledge elements and bundles in a diversity of customs and traditions, explicit and implicit contracts, local and national statutes, covenants and international regimes. The creation of new domains such as virtual domains has intensified the contestation between different domains of knowledge, with technology playing an important function as an interlocutor. The location of traditional knowledge in articulable and tacit forms inside and outside arenas of contestation influences what is protectable from what is not. Section 3 identifies the problem areas and the plurality of ways in which the same traditional knowledge may be regarded by different actors within these distinct and overlapping spaces.

The modalities of search for convergence and consensus are shaped by the motives and powerbases of actors who occupy niche positions of advantage within arenas of contestation. This makes consensus-seeking complex and acrimonious. Section 4 traces the genesis of preferred outcomes that inform today's policy choices to the way the intellectual property rights system developed. This is followed by a discussion on how and why and in what respects the world's intellectual property rights system is incomplete in scope, inefficient in application, inequitable in terms of outcomes, and incompatible with other international regimes.

In Section 5, potential conflicts between the TRIPS agreement of WTO and other international agreements, mandates and regimes concerning trade in services in knowledge-intensive sectors are analysed with particular attention to the division of nature under sovereign jurisdiction introduced by the Convention on Biodiversity (CBD) in a departure from principles of common heritage of mankind, the mandate of UNESCO on educational, scientific, and cultural matters, the UN environment programme (UNEP), the transfer of technology commitments under UNIDO and CBD, the development mandate of UNDP, the trade and development linkage sought by UNCTAD, the

aftermath of the collapse of the CGIAR *'sui generis'* system for germplasm banks, and the development mission of the World Bank.

The cross-border trade in traditional knowledge, genetic resources, and folklore makes local and national commons to function as a global commons, *de facto,* without the force of any *de jure* sanction to implement global policies or international agreements on transfer arrangements. Under-use and exhaustability have profound implications for inter-generational and spatial equity. These are analysed in Section 6 to determine whether traditional knowledge has characteristics of public goods by examining limits to non-excludability, and, non-rivalrous consumption.

Depending on whether traditional knowledge is treated as a pure or an impure public good, this affects the architecture of markets and market outcomes. The economics of valuation of traditional knowledge is analysed in Section 7 by admitting two orders of static effects and three orders of dynamic effects. Policies designed to maximise early positive gains from static effects may be counter-productive if they cancel out the dynamic effects, unless the chronology and sequencing of these effects can be reasonably presumed and taken into consideration.

The limitations of desirable defensive measures such as digitalisation of traditional knowledge, which are necessary, but are not sufficient are noted in Section 8. I then introduce the legal and political nature of international trade negotiations in the TRIPS council reviews of the WTO and TK developments at WIPO in Section 9. Finally, in Section 10, policy choices at national and international level with reference to experiences in India and other countries, and prevailing international treaties are considered and I present a framework for national 'sui generis' protection of traditional knowledge.

2. WHY IS TRADITIONAL KNOWLEDGE A TREASURE TROVE ?

Traditional Knowledge is a treasure trove of diverse and complex resources and responses of use and tradable value which spring from insights, intuition, experiential learning, and a diversity of knowledge and skill traditions in contemporary practices. Taking into consideration the special features and characteristics of how different forms of traditional knowledge are held and transmitted by knowers and users from the perspective of what is knowable, by whom, and how, it becomes possible to distinguish the tangible from the intangible, the explicit from the implicit, the articulable from the articulated, the articulated from the tacit, the conscious from the unconscious, the personal from the communal, and the private from the public. An indicative taxonomy of traditional knowledge developed on the basis of Mathur (2000) and Gupta and Sinha (2002)[7] can envisage twelve categories of traditional knowledge (listed hereunder as TK-1 to TK-12):

TK-1

Personal and private individual insights/skills received from ancestors or in Guru-Chela type traditions and practised privately. An example of this would be the talent to treat mumps by writing a *kalma* or the use of psychic transference in treating mental illnesses and other pathological conditions (Neki,1973).

TK-2

Skills learnt personally or privately acquired to socially or publicly practise arts and crafts singly, in families, communities, professional guilds and other forms of socio-technical systems within a set of parameters recognised as style or genre including verbal expressions such as stories, poems, songs, symbols, indications, musical and dance

[7]*The Gupta-Sinha formulation has 15 categories but some of the categories are customary rights, rather than types of traditional knowledge. Their formulation does not distinguish knowledge from skill, nor differentiate knowledge from justified beliefs based on experiential insights, neglecting the essential difference between 'connaisance' and 'savoir'. The Gupta-Sinha formulation also does not separate articulated knowledge (as a subset of articulable knowledge) from tacit knowledge nor does it distinguish between between conscious knowledge and unconscious internalisations. These infirmities render the conception difficult to operationalise, especially when the objective is to understand how knowledge is held, protected and transferred.*

expressions, tangible expressions such as painting, carving, and expressions by actions. Examples:Gregorian chanting of hymns, singing of ragas, miniature painting, patterning of *paisley* designs, fine weaving, handicrafts of various kinds etc.

TK-3

Skills learnt socially and publicly to develop, use or modify ideas in praxis in accordance with task group norms, emerging cultural traditions and customary laws. Examples: bone-setting of fractures, traditions of stone and bronze sculpture, action research methods for diagnosing nature, human groups and animal groups.

TK-4

Collective wisdom / knowledge accumulated and developed both privately and socially within a sentient group and information secretly held by it and used for social, economic or financial benefits for the community as a whole as part of cultural traditions. Examples: goldsmiths use patterns in ways discernible by others of their trade; '*kar*' sewerage workers in Bansberia, West Bengal, are the only ones to have a (mental) map of the Hooghly sewerage system; Jesuit exorcists, magic covens, Kamakhya tantriks and Siberian/Ugric/African shamans who strive to understand mysticism in nature and how to harness cosmic energies.

TK-5

Experiential insights and justified beliefs codified by practising individuals over generations which become known to individuals or community and are inter-generationally transferred and publicly documented. Examples: Siddha, Ayurveda, Homeopathy and Unani systems of medicine which are mainstream medical systems for more than 80 percent of the people in India, and certain parts of Central Asia, South-Eastern Europe and Africa.

TK-6

Kinship, cultural, social or spiritual practices of a community associated with genetic heritage and natural resources where the concepts and logic of ideas in praxis may be

known/unknown to individual/s. Examples: knowledge about patterns in seasons, natural cycles, natural conception and contraception methods invented based on discovery of biorythms and fertility cycles; maternity and child rearing practices; treatments based on herbal preparations and dietary supplements; measures, methods and procedures; application of *vastuu* or *fung shui* in designing interiors etc.

TK-7

Traditional Knowledge available in a community but limitedly practised by individuals or community. Examples: water harvesting methods, harnessing of solar energy applications through magnifying lenses; techniques of biomass conservation and conversion, pest-control, sanitation, hygiene etc.

TK-8

Articulable tacit knowledge of a community' s internal relatedness and experiences of living in its local habitat accessible only when converted into articulated forms. Examples: Finding fish-spawning beds from signs and patterns in nature; inferences from and about avian migratory behaviour; discovery of norms, and singularities such as milkmaid-type immunities through sociological investigations; understanding the logic of taboos through anthropological documentation such as that undertaken by travellers and scholars.

TK-9

Traditional knowledge of a community not reachable/accessible without being part of the community in its living habitat. Examples: insights from experiential learning (songlines dreaming, social dreaming in matrices); sensitivity to disease vectors; knowledge acquired only through personal intimate relations as couples, in families and small cohesive sentient groups.

TK-10

Widely disseminated traditional knowledge through formal/informal education and training, documentation or media or word of mouth and used by wider public. Examples:

Application of turmeric (haldi) for healing cuts and wounds; use of neem as a therapeutic agent; yoga for good health; reiki for meditation, Sahaj Marg and Sudarshan Kriya for personal growth etc).

TK-11

Limitedly disseminated traditional knowledge based on nature, asset specificities or cultural traditions. Examples: Use of lantena for making furniture; games, cultural identifiers, event signifiers, symbols, figures, pictures, drawings, illustrations and other historical and traditional forms which have value and are more than expressions; semiotic supplementations in human interactions like salmon or *hilsa* homecoming ceremonies in estuary and mangrove ecology cultures or specific feasts or festivities to commemorate time markers as practised by Nagas in North Eastern India, Cajuns in Louisiana etc.

TK-12

Endangered knowledge hardly practised by any one . Examples: benefits from the use of *mudras* (postures*)* in every day life; rare art, crafts, music and dance forms; language traditions; known therapeutic properties of near-extinct plant species.

The claims of knowledge holders from within the above taxanomy may conflict but are not difficult to reconcile within distinct cultural or national traditions. A different kind of contestability arises from the way different knowledge domains have links to each other and enmesh or compete. For example, when biotechnology enables a firm to produce and commercially market a megabuck drug by isolating active ingredients from therapeutic compounds in a healing herb known to a grandmother, two different knowledge domains come to possess therapeutic skill. The application of technologies and clinical trials enable drug companies to control for side effects or gene susceptibilities in ways a grandmother may not.

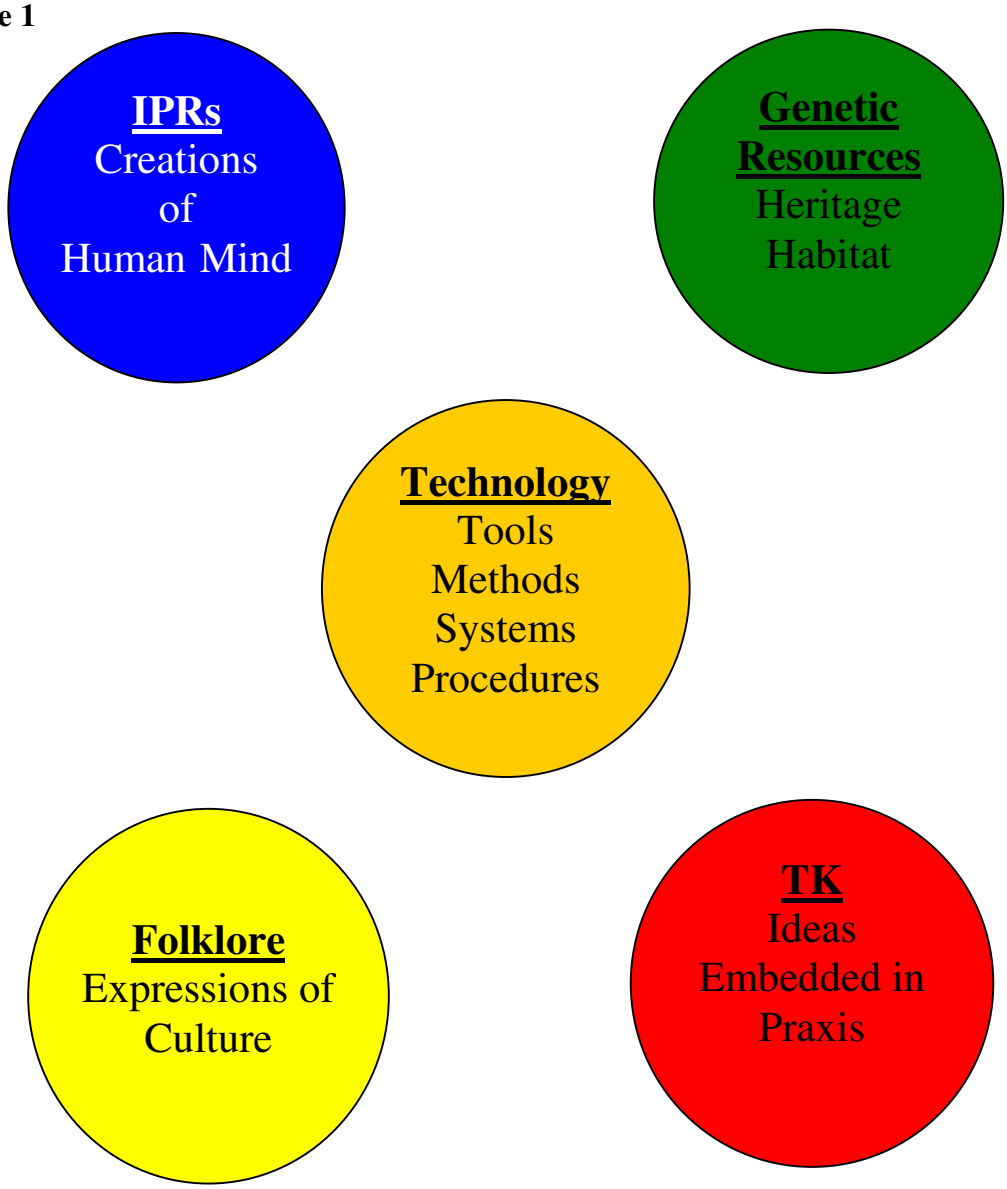
This kind of development is true of many kinds of transfers between old and new domains whenever some new rights of use and commercial exploitation arise for the first

time[8]. The arenas of contestation involve knowledge domains discussed in the following section.

3. KNOWLEDGE ARENAS

Five distinct knowledge arenas concerning traditional knowledge are identifiable (see following Figure 1).

Figure 1



[8] *When virtual domain names first became ownable, names of companies such as Tata, State Bank of India, Port of Helsinki were quickly appropriated by first-movers who offered to sell the names to the companies at a profit. The Port of Helsinki resisted but lost the court case because the Port of Helsinki had previously called itself only 'Helsingin Satama' by its Finnish name.*

3.1 Technology

Technology is placed at the centre in Figure 1 because it is the most potent change-inducing force in our times and the major interlocutor between all knowledge domains and knowledge flows. The way we make and do useful things and extract usable things includes information from organic resources. Technology as a set of tools, methods, systems and procedures is a primary determinant in the design of tasks and socio-technical systems. Necessity, that proverbial mother of invention, causes tools to be made according to the nature and definition of the task; from standards of perfection and quality, scope, longevity, logic that the task demands; from factor substitutability as in the case of labour-saving induced by drudgery avoidance, or size, scale, accuracy, human hazard, or economic substitution of labour by capital; substitution of one energy source by another, substitution of one method by another that is more parsimonious; by the substitution of products, raw materials, new uses, new forms of organisation, new scale, new scope, and new ways of combining resources or for seeking new responses in the process of applying tools, methods, systems, processes or simply in response to new structures or to create or eliminate by-products.

The fecundity of technology and its fungibility can significantly alter the valuation of all resources that technology combines with, uses or serves through new responses. The bio-engineering of bacteria that break oil spills and the oncomouse for cancer drug development are examples of uses of such technologies in life sciences. Biotechnology is a whole new way of developing new therapeutic products. However, its diffusion is neither ubiquitous nor equitable. Technology is closely held and stiffly contested as a source of competitive advantage. Capital Scarcity causes it to remain unevenly diffused. Although ownable privately, access to cutting edge technologies remains an issue also for inter-governmental contestation.

Microorganismic patenting was made universally obligatory by the TRIPS agreement in all WTO member countries. Article 27.3 (b) of TRIPS incorporated a minimal agreement to revisit this provision by 1999 because the EU had resisted patents on living organisms

at the time. The term ‘microorganism’ was left undefined by TRIPS and there remains great reluctance to define it. Under the current practice of the European Patent Office, intra-cellular biotic material is considered covered by the term ‘microorganism’ and so is extra-cellular biotic matrial which may be mutated or synthesisied. The term ' microorganism' doesn’t refer to small microscopic germs invisible to the naked eye that could be presumed to be of limited consequence. About 20 percent of the biomass of the planet and its biodiversity consists of microorganisms (bacteria, viruses, sub-viral agents, fungi, yeast, actinomycetes, protozoa etc.). Besides, the term ' microorganism' may include, in different national jurisdictions, cells, genes, gene fragments, cDNA sequences, cell lines, tissues and plasmids. Isolation and extraction are considered genetic modification and genetic modification enables patentability of both processes and outcomes. This implies that tools and technologies available at a few locations can be used to patent the keys to life and therapeutic substances at the intra-cellular level for a very large number of the world’s species.

The three universally agreed criteria for patentability (novelty, non-obviousness, and utilty) pose problems when applied to microorganisms. Discoveries of nature are universally excluded from patentability but claims based on isolation of intra-cellular (naturally occurring) biotic material through human technological intervention have been admitted in some jurisdictions. The absence of criteria for distinguishing between ‘essentially biological processes’ and ‘microbiological processes’ also remains controversial. Since products resulting from patentable ‘microbiological processes’ and other technical processes can be plants and animals, differences in levels of protection of conventionally bred new plant varieties and technologically engineered new plant varieties with and without terminator genes may yet be specified in national jurisdictions with due regard to replicability by independent discovery through fair means, uniformity and stability of a bred-line. The deposit of microorganisms may be made in any depository recognised under the Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure, 1980 (hereafter referred as The Budapest Treaty). Most of the countries lack depositories capable of holding V-1, V-2, V-3, V-4, V-5 types of microorganisms. This leaves scientists in many countries

without access to knowledge for advancing innovations, despite a technical disclosure having been made. It also defeats the very purpose of disclosure as part of the *quid pro quo* for grant of temporary monopoly for commercial exploitation (Mathur, 2003b)[9].

The poignant situation obtaining in scientifically advanced developing countries like India, Brazil and China is noteworthy. In the case of India, the demand in 1997 for biotech products was then estimated to be Rupees 71, 540 million (about US $ 1.6 bln) and about 30 percent of the products could not be produced with technologies available in India. The corresponding figure in 2004 is about 20 percent, according to the Scientific Advisor of the Department of Biotechnology (Tripathi, 2002, p.14). Out of over 800 firms in the biotech sector, fewer than 18 have modern biotechnology capabilities.

3.2 Traditional Knowledge

Traditional knowledge consists of ideas embedded in praxis. A part of it comprises recipes that may be articulable even if not yet articulated. From the taxonomy noted in Section 2, it is obvious that TK frequently involves learning by doing, learning by experiencing and the care and feeding of ideas in cultures and traditions where the practice of invoking individual temporary monopoly rights to commercial exploitation as a *quid pro quo* to disclosure is not widely known or prevalent because its practice, limited in geographic scope and governed by modalities unmediated by market transactions may not require it to be traded cross-border even if its commodified products were so traded or tradable.

Additionally, traditional knowledge is nurtured as a resource in social contexts in which social capital is an attribute of belonging. While one may acquire social capital by purposeful actions, the capacity to transform social capital is not a licence to excise it for pecuniary gain and the ability to do so may be circumscribed by customary laws. Such

[9] *France, Sweden, Russia and the U.K. have V-1, V-2 and V-3 depositories. Only U.S.A. has depositories for V-4 and above. Among developing countries, only China and India have depositories under the Budapest Treaty. The Indian depository in Chandigarh does not cater for deposits of any viruses. The issue of provisioning a virus depository in India's Chandigarh facility created for microorganisms under the Budapest Treaty or bringing virus depositories at Gwalior, Pune or Bangalore under the Budapest Treaty remains unresolved.*

knowledge may be contemporary or non-contemporary and open to independent discovery and piracy without acknowledgement or attribution. To the extent that it did not harm the interests of the holders and their patrons inhabiting local spaces, its economic use by others beyond its borders of praxis was not an issue. The question of (mis)appropriation by third-parties and the need for benefit-sharing with traditional holders has assumed significance in the context of TK being a means of pecuniary gain and economic development. Globalisation, trade and intellectual property rights provide incentives to the holders as well as to others to acquire rights over such knowledge because the value of such knowledge has grown.

3.3 Genetic Resources

Genetic resources represent a domain closely linked to traditional knowledge for a number of reasons. Heritage protection is concerned with conservation and sustainability and the care and feeding of ideas in praxis have the local habitat not only as their proximate natural context but also as the source of such ideas and a living repository of such ideas as recipes for quality of life and inter-generational continuity of local communities. Genetic resources can be altered with human interaction to take on characteristics not found in nature. Plant varieties can be created by plant-breeding techniques (for landraces and traditional varieties) as well as by genetic engineering.

The ownership of, control over and access to genetic resources has acquired new dimensions of contestability during the 1990s for three reasons. Historically, nature was regarded as common heritage of mankind until the Rio Treaty (Convention on Biodiversity or CBD) which derogated it under sovereign jurisdictions, introducing a new dimension of international contestability over beneficial natural resources. Secondly, habitat sustainability requires global solutions to natural degradation in nationally demarcated territories but the question of sharing in the costs involves contestation over responsibilities for biodiversity conservation. Thirdly, the emergence of genomic technologies has raised the value of biological resources for development of products with high tradable value but the market for access to such resources and related

traditional knowledge under benefit-sharing arrangements is missing. This renders the domain of traditional knowledge vulnerable in three ways:

1. Forms of traditional knowledge that depend on plant genetic resources are accessed on the basis of authority vested in States through enabling laws and also without them, where none exist. *In-situ* plant varieties are grown *ex-situ* anywhere without a requirement of prior informed consent and without disclosure of its origin[10].

2. There is no international standard for what constitutes novelty for the purpose of patentability. In the absence of cognizable legal disclosure, novelty in the use of a genetic resource can be claimed through inventive steps at whatever threshold a particular patent examiner of a country is willing to admit a claim to novelty.

3. Undisclosed prior art has the same status as a trade secret. Persons other than holders of traditional knowledge, can also make claims to TK without acknowledging the prior art. Due to extreme inequalities in wealth and income, between developed and developing country citizens and governments, and also between corporations and third world governments, it is prohibitively expensive for many of those wronged to claim redress after the damage is done.

About 25 percent of all known medicines are derived from plants and 75 percent of them have the same or similar therapeutic uses as in native traditional cultures (Moran, 1999). Almost 80 percent of such medicines are developed based on extraction, isolation and mutations of genetic material sourced from angiosperms (flowering plants). Brazil, China, India and Peru are individually home to more than one-third of all known angiosperm species in the world. Locally available plant genetic resources have an important role in drug discovery and also as a source of raw material for commercial

[10] *'In situ' condition is the condition in which a biological resource is found in its ecosystem or natural habitat. In the case of a domesticated or cultivated plant variety, its condition is 'in situ' when that variety is found in the cultural context in which its specific properties have been developed. 'Ex-situ' condition is the condition in which a biological resource is found outside its natural habitat. Any lineage that is cultivated within its country of origin is not considered to be an ' ex-situ' condition in the national laws of many countries.*

exploitation. The cost of raw materials is a very small part of the costs of a packaged therapeutic marketable worldwide. The carers and feeders of tangible organic material and the intangible know-how connected to it are easily by-passed when incentives for reducing the costs of drug discovery and drug development require firms to build cross-border value chains.

The combination of biotechnology and selective targeting based on traditional knowledge of plant genetic resources in biodiversity hotspots can halve the costs of drug discovery and development. It is noteworthy that despite advances in combinatorial cytochemistry, it has not been possible to isolate and synthesize known plant genetic resources to any significant extent. Thus, the danger of sub-optimisation through under-use due to lack of access is as serious as the hazard of by-passing potential benefit-sharing arrangements with locations from where plant genetic resources are sourced and where the plant may be plucked to extinction through neglect or wilful destruction.

3.4 Folklore

Folklore (or traditional and popular culture) is the totality of tradition-based creations of a cultural community, expresed by a group or individuals and recognised as reflecting the expectations of a community in so far as they reflect its cultural and social identity; its standards and values transmitted orally, by imitation, or by other means. Its forms are, among others, language, literature, music, dance, games, mythology, rituals, customs, handicrafts, design, architecture, and other arts[11]. The protection of folklore from the perspective of conservation and intellectual property rights is aimed at groups whose identity it expresses.

All expressions of culture may be regarded to be in the public domain to the extent that they are observable, imitable, communicable, adaptable and diffusable without legal hindrances. Much of folklore is in the public domain because it is both expressed and part of the observable universe of creative expressions. Communication is a basic drive of all

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[11] *This definition follows the UNESCO recommendation of 15.11.1989 incorporated into its model legislation.*

mankind. Expressions of culture may be found in all media for characterising experiences for organising and ordering things and relationships. Some forms of distinctive identification may be discerned through artefacts in the semiotic tradition. Others are inferred from relationships among people and between people and natural resources at specific locations. Both forms are protectable, to some extent, through copyright laws, design rights and geographical indications, but seldom through patents.

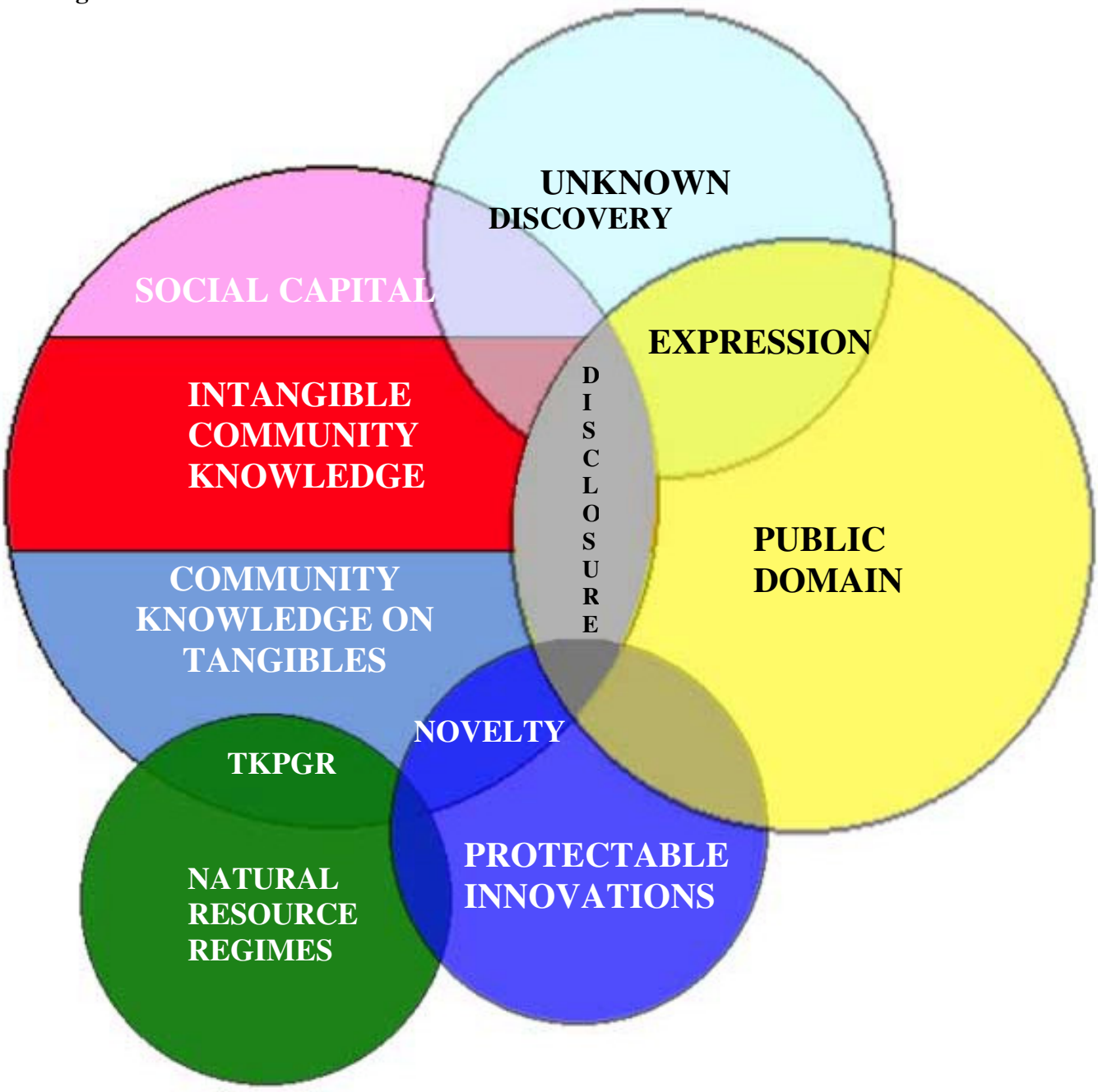
Recorded observations of practices by sociologists, anthropologists, journalists, travellers, once disseminated, also become part of the publicly available pool of knowledge which is neither secret nor protectable as belonging to the protagonists whose expressions of culture are so noted. In other words, if someone observes and writes about Indian villagers who break a neem twig and foam it in the mouth in the morning, knowledge of the use of the neem twig for dental care comes into the public domain. The mass production and marketing of oral care products sourced from the neem twig may still be branded and trademarked by as many players as care to enter the market. When new properties of neem or new uses are found and novel and useful non-obvious products developed based on inventive steps that are not part of documented prior art, the question of patentability can arise. It is obvious that such ideas in praxis are easily recognised expressions of culture (folklore) which are publicly available to anyone to develop or innovate upon and thereby affect its value. Ownable traditional medicinal knowledge under intellectual property rights regimes can arise from the combination of folklore, genetic resources, and traditional knowledge. Folklore as a knowledge arena, by itself, is seldom protectable except in its expressed forms under copyright or design laws or in the form of rights of indigenous peoples (as in the Australian songlines case where Vietnamese-made carpets with songlines designs were disallowed from being imported into Australia).

3.5 Knowledge protectable by intellectual property rights

The system of conferring intellectual property rights (IPRs)for exclusive commercial exploitation on creations of human mind for a time-limited period has its origins as the reward for innovation. The purpose of the patenting system is to induce early disclosure

of an innovation to enable more human advancement and innovation in society as a whole. IPRs were not instituted to confer income-generating privileges through perpetual, long-term or hereditary property rights. By disclosing the innovation, human progress is facilitated because it enables everyone to make further useful innovations, and provides an incentive to disclose for the first to innovate. Traditional knowledge consists of 'ideas in praxis', capable of being innovated further but such ideas in praxis may not have been protected as intellectual property, even if they are so protectable. Further, the line between the next inventive step warranting a protectable innovation and the idea in praxis becomes difficult to know if a disclosure does not credit the original idea in praxis. The way the five knowledge arenas juxtapose into each other and proliferate further new forms of contestation is depicted in Figure 2. The TK arena of Figure 1 that overlaps with folklore and public domain consists of community knowledge on tangibles, a community's stock of intangible knowledge and social capital. Its intersection with the Genetic Resources arena is depicted by TKPG re:traditional knowledge of plant genetic resources. This intersection set overlaps with the IPR arena of protectable innovations which are novel with one end as trade secrets and the other as disclosures.

Figure 2


UNKNOWN DISCOVERY
SOCIAL CAPITAL
EXPRESSION
INTANGIBLE COMMUNITY KNOWLEDGE
DISCLOSURE
PUBLIC DOMAIN
COMMUNITY KNOWLEDGE ON TANGIBLES
NOVELTY
TKPGR
PROTECTABLE INNOVATIONS
NATURAL RESOURCE REGIMES

The term ‘disclosure’ has a technical connotation. It means a deliberate act for the purposes of securing privileges to a protectable innovation as a *quid pro quo* to disclosure. Thus ' disclosure' is different from knowledge revealed by observing expressions of culture. Expressions of culture that have found their way into the public domain are only a small subset of that which is unknown (but knowable). There is much to be gained from ethnographic studies because new, useful and relevant insights do not necessarily have to be brought to the public domain. Instead, they can be ' disclosed' and claimed as innovations, rather than imitations when they form part of a patent application. Since protectable innovations cover all human endeavour where non-obviousness, utility and novelty can be demonstrated, the critical test of patentability rests with the threshold of novelty acceptable to a patent authority.

The balance between the five contested arenas is set by the different thresholds of novelty used by examiners in different patent offices guided by court judgements in their jurisdictions in a diversity of legal traditions. The outcome is neither uniformly standard nor predictable. In the United States of America (U.S.), ‘all human endeavour under the Sun except production of human beings' is regarded patentable[12].

In the case of traditional medicinal knowledge, inventions that rely upon novelty claimed for active ingredients isolated or synthesised can be based on plant genetic resources sourced from *in situ* plant varieties growing in nature or from *ex situ* collections cultivated for specific purposes. A scientist in a laboratory may be able to distinguish between the relative contribution of an *in situ* organic resource and the informational value that resource yields in *ex-situ* collections of the same or bred and derived plant varieties. Firms are aided by advanced accounting and information systems and communication technologies to apportion benefits and the structuring of rewards to an invention at different points of a value-chain. However, traditional knowledge holders who make discoveries in nature and care for or cultivate an *in-situ* plant genetic resource unencumbered by employment contracts, stock-market valuations of their assets, transfer-

[12] *At the seminar when this study was presented, my colleague Shankar Acharya was quick to observe that the Sun has mercifully been spared from patentability.*

pricing arrangements and advanced degrees in economics are ill-equipped to distinguish between the social capital that binds the carers and feeders of ideas, the intangible knowledge embedded in praxis and the knowledge of organic tangibles even if the last aspect is codified in an articulated form. Further, the strong likelihood that oral traditions dominate makes it improbable that local knowledge can independently be verified in parcels or lots or be separately valued and priced based on imputed notions of probable market size. What makes the problem even more intractable is that such knowledge may be contemporary or non-contemporary and its applications may again be contemporary or non-contemporary. The plurality of ways in which the same traditional knowledge may be regarded by different actors within these distinct and overlapping spaces is depicted in Figure 3 using neem as an example[13].

Figure 3 FORMS OF TRADITIONAL KNOWLEDGE

TRADITIONAL KNOWLEDGE	**CONTEMPORARY**	**NON-CONTEMPORARY**
TANGIBLE	(1) NEEM PACKAGED AS TOOTH PASTE	(2) NEEM TWIG FOR DENTAL CARE
INTANGIBLE	(3) NEEM FOR CALCIUM ABSORPTION IN MAMMALIAN BONE TISSUE	(4) NEEM AS ANTISEPTIC

The search for convergence and consensus on complex TK and GR matters is affected by the motives and powerbases of actors who occupy niche positions of advantage within the overlapping arenas of contestation and this makes consensus-seeking acrimonious.

The enormity of hazards has increased with advances in biotechnologies. While it is futile to advocate a luddite approach, it would be useful to understand the gravity of the problem and address it through development and diffusion of biotechnology.

[13] *It is noteworthy that there are 157 valid patents based on neem and only one neem patent was invalidated.*

How substances are sourced, isolated and developed may get obscured through bioengineered mutations, innovations, and cloning. This risk is particularly significant for *ex-situ* collections of plant genetic material sourced without acknowledgement from undisclosed *in-situ* plant varieties. Argentina, Brazil and Korea are among the few countries that have made use of the exclusion clause against biotechnological inventions available to safeguard public order or morality (Article 27.2 of TRIPS). Japan and Brazil have made use also of the permissible exclusions under Article 73 for national security reasons. In the case of microbiological or non-biological processes, whether the exclusions in TRIPS under Article 27.3 (b) override Article 28 remains an unsettled question.

The genesis of preferred outcomes that inform today's policy choices need to be related to the way the intellectual property rights system has developed.

4. THE INTELLECTUAL PROPERTY RIGHTS (IPR) SYSTEM

' Intellectual property right' is a legal concept that deals with rights and privileges over protectable inventions, designs, artistic works such as music, books, films, performing arts like dance, sculpture, photography, integrated circuits, distinctive signifiers like trademarks and geographical indications, life forms such as plant varieties and microorganisms. IPR laws are not designed to protect ' ideas' in praxis. In fact, they do not protect ' ideas' at all (see the definition of intellectual property at http://www.wto.org). The term 'idea' does not feature in the WIPO definitions either. Only the specific, non-obvious, useful disclosure of expressed ideas is protectable against unauthorsed commercial exploitation, not the idea itself.

The reference to creations of human mind (which can be discoveries or inventions) recognises nine categories of protectable IPRs for the general benefit and progress of innovations. These are copyrights and related rights, trademarks, geographical

indications, industrial designs, patents, layout designs of integrated circuits, undiclosed information, protection of plant varieties, and petty patents/utility models.

The TRIPS agreement as part of the Uruguay Round of multilateral trade negotiations is the most far-reaching overhaul of IPR obligations of 146 WTO member States since 1968 when the Stockholm Conference created WIPO (from BIRPI). Trade related intellectual property rights are subject to WTO's dispute resolution mechanism and a number of patents and copyrights cases have been heard and decided. In contrast, the absence of linkage between trade and intellectual property rights at WIPO enables discussions without strings attached but it also inhibits speedy 'give and take'. WIPO treaties lack a dispute settlement mechanism and follow archaic block voting systems by grouping countries as developed, developing, socialist etc making it a debating forum where consensus is elusive and procedural bureaucracy profound. The potential for trade-offs between IPR issues and trade matters as part of package deals at WTO have therefore made inroads into the erstwhile IPR monopoly of WIPO.

The implementation of these nine categories of IPRs in developing countries is not much researched and documented independent of the umbrella of treaty organisations responsible for administering the IPR regimes. There is a polarisation of expert opinion between those who advocate strong adherence to the hurriedly negotiated TRIPS agreement, and others who advocate transitional dilution to cater to special conditions and national interests in developing countries such as food security, public health, poverty alleviation etc. (Beier and Shricker, 1996; Gervais, 1998; Correa and Yusuf, 1998).

In the din over controversies over services and GATS, developing countries paid scant attention to IPRs in their preparations for the Uruguay round so that when TRIPS came on the table, many countries were caught unawares (Zutshi, 1998). The parliamentary record of the Indian Parliament shows that the Parliament was misled or kept in the dark about TRIPS (see pages 12 to 15 of the Report of the Peoples' Commission on Patent

Laws for India, February 2003)[14]. Section 10.3 of TRIPS went way beyond the Berne Convention by enabling compilations of non-copyrightable material protected as databases without any requirement of originality or intellectual creation, a position subsequently enshrined by the EU in its Directive on Legal Protection of Databases on 11.3.1996. This kind of development presents a serious hazard to codified traditional knowledge.

The IPR systems-taken in their entirety- are incomplete in scope. This incompleteness is observable at four levels- geographic, substantive, functional and operational.The process for substantive patent law harmonisation and the compromise agreement achieved only limited procedural harmonisation. The jurisdictional gaps remain and the discussion on a new category of global public goods is at an incipient stage of evolution.

Innovations are inhibited by the risk of underuse of genetic resources in the absence of international access regimes and benefit-sharing protocols. This is inimical to the biopharmaceutical industry being strangulated by high costs to a degree that the world' s largest and most successful technology and life sciences companies such as Pfizer have resorted to holding significantly high net cash positions. Recent research studies have shown that market valuations of these companies are much greater than the declining value of their intangible asset portfolio to cater to the eventuality that expiring patent values are unlikely to be replenished (Passov, 2003)[15]. Inequitable access and benefit-sharing remain a dampener for bioprospectors. Procurement zones, the world' s high biodiversity hotspots, are, in turn, constrained by inadequate biotechnology transfers perpetuating incentive gaps for biological material transfers from *in-situ* plant varieties and the development and exploitation of local traditional knowledge. This lose-lose situation is caused, in sum, by world's intellectual property rights systems being

[14] *India' s negotiators had more than four years to prepare for TRIPS but remained oblivious to the possibility that the new agreement would be a single undertaking. They expected to be able to stay out of parts of it or veto the whole set of agreements using India's veto as a founding member of GATT. Zutshi (1998) clarifies some of the reasons behind the misplaced optimism and misinformation to Parliament.*

[15] *About half of all valid pharmaceutical patents in 2003 would expire by 2008 and the rate of their replenishment by new patents affects intangible assets and liabilities of firms.*

incomplete in scope, inefficient in application, inequitable in outcomes, and, incompatible with other international regimes.

The situation is further complicated because there are a number of international organizations with specific mandates and also international treaties and conventions that cover the entire range of subject matter with which TK and GR are concerned. There is no order of precedence or prior claim that any one multilateral treaty or international organisation may appropriate to derogate from the mandate of another treaty or organisation. The observance of trade regimes calls for an examination of relevant statutory and contractual provisions. If inconsistencies or voids or anaomalies are found. it requires removal of anomalies and incompatibilities that have remained unaddressed or unresolved.

5. INCOMPATIBILITIES BETWEEN INTERNATIONAL REGIMES

Potential conflicts between TRIPS and other international agreements, mandates and regimes inhibit trade in services in knowledge-intensive sectors, because trade is not the only priority. For WTO, IPRs are a question of enforceable legal rights. For WIPO, IPRs are a political question where traditional knowledge, genetic resources and folklore are discussed together in the context of spatial and inter-generational equity.

The credibility of the patent system administered by WIPO, conservation of nature in sovereign jurisdictions under the Convention on Biodiversity (CBD), the mandate of UNESCO on educational, scientific, and cultural matters, clearing house mechanisms under the UN environment programme (UNEP), the transfer of technology commitments under UNIDO and CBD, the development mandate of UNDP, the trade and development linkage sought by UNCTAD, and the aftermath of the collapse of the CGIAR *'sui generis'* system for germplasm banks, under the development mission of the World Bank, and ILO Convention 169 on Indigenous and Tribal peoples are some of the other mandates that conflict with patentability criteria and rules of TRIPS.

UNESCO does not distinguish between traditional cultural expressions on the basis of their contemporariness-an artificial distinction that has being introduced in the discussions at WIPO and WTO which could limit the scope of protection to TK and folklore. It would be illogical to treat a subject matter to be in public domain as if IP laws had already been applied to it when the conception of rights in that knowledge has not reached a stage where such IP protection is available. The preservation of intangible cultural heritage is a UNESCO priority since the 1970s. Model provisions on the protection of folklore developed in 1982 have remained unimplemented because of their non-binding nature. The UNESCO resolution 31 C/30 of 2001 for an international treaty on intangible heritage would be practically extinguished if *"the practices, representations, expressions, knowledge and know-how*" and the "*instruments, cultural objects, artifacts and spaces associated with them that communities, groups, and if necessary, individuals recognise as belonging to their cultural inheritance*" are not protected. Such protection is vital both for conservation and development if identities and communities are to be respected to promote cultural diversity and human creativity[16].

Several international instruments related to human rights and rights to development are also jeopardised. The UNESCO International Committee on Bioethics has pointed to the inequity that the specificity of human genetic data (compared to other personal and medical data) is particularly significant for developing countries which are very often the sources of samples used by laboratories in developed countries[17].

The UNESCO World Conference on Science held in Budapest in 1999 conferred official recognition to the plurality of knowledge systems for the first time. The Local and Indigenous Knowledge Systems (LINKS) project to promote indigenous knowledge and worldviews to promote the Millenium Development Goals of environmental

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[16] *See the statement of concern expressed by the UNESCO representative at the WIPO IGC in WIPO/GRTKF/IC/5/15, paragraph 52.*

[17] *Many biopharmaceutical partner firms in developing countries function mainly as fronts for collection of samples of biotic and genetic material.and for inexpensively conducting bioinformatics and clinical trials in geographical regions where the notion of liabilities for unintended consequences is weakly developed and compensation for human lives lost or damaged lower than in developed countries.*

sustainability and poverty eradication can progress only if plurality of knowledge and the rights in such knowledge are also equal.

At FAO, a pool of genetic resources was held in trust for the international community aimed at food security and sustainable use. The genetic resource policy, to the extent that it deals only with collective resources, was not encumbered by IPR considerations until the CBD derogated nature to sovereign jurisdictions. This created two kinds of collective resources-one, collectively held under the Consultative Group on International Agricultural Research (CGIAR) system of FAO and another, collectively held in sovereign territories. The same rules cannot be applied to both sets of collective resources. Without a system to know from which collection a genetic resource has been sourced, the interface of the IP system with genetic resource regimes remains incompatible. The database of CGIAR *ex-situ* collections under the System -wide Information Network on Genetic Resources (SINGER) is the largest collection of plant genetic resource in the world and no IP rights on these are permissible. An IPR moratorium came into force in 1994 with the introduction of material transfer agreements (MTAs). The Code of Conduct for Germplasm Collecting and Transfer negotiated at the FAO is not yet free from problems over implementation and the International Treaty on Plant Genetic Resources for Food and Agriculture would come into effect only by the middle of 2004. The proposal at the Conferences of the Parties to CBD for resolving the IPR issues concerning an international certificate of origin/source/provenance remains merely a proposal and is mandated to remain so until the Eighth Conference of the parties when progress on this work would be reviewed. The CBD has passed the responsibility for more information gathering on access and benefit sharing to WIPO asking WIPO to pass back the responsibility to CBD at a future conference yet to be held when measures recommended would be discussed.

Meanwhile, the interpretation that germplasm deposited in global depositories prior to the CBD (there are more than 600,000 specimens) can be accessed by scientists, plant-breeders and others for research purposes without any obligation for benefit-sharing with the source countries does not have widespread support. There have been attempts at

privately appropriating CGIAR material as in the Chickpea case in Australia, over material originally sourced from ICRISAT, India. The CGIAR system is supported by 46 countries (24 developing countries and 22 industrialised countries), 4 private foundations and 12 regional and international organisations. One of the most devastating outcomes from the combination of CBD and TRIPS has been the collapse of the CGIAR system of the FAO. Hardly any new deposits have been made in these seed banks and germplasm banks in the past ten years. The key role that national agricultural research organisations played in CGIAR is gradually being substituted by greater dependence on corporate sources for funding through partnerships. These include three giants at the frontiers of biopharmaceutical innovations.

Governing the impact of genetic use restriction technologies on indigenous and local communities is within CBD' s mandate but CBD is constrained, due to TRIPS rights, in implementing paragraph 44 (0) of the action adopted by World Summit on Sustainable Development over "*an international regime to promote and safeguard the fair and equitable sharing of benefits arising out of the utilization of genetic resources*" The lack of rules obligating disclosure of origin of GR and relevant TK in IP applications lies at the heart of the problem[18]. Purists and legal pundits argue that TRIPS cannot and does not prohibit CBD from carrying out its mandate. However, its binding provisions do not obligate disclosure of origin, prior informed consent, and access authorisation under benefit sharing for TK. These inconsistencies do create, *de facto,* an effective *estoppel*. At the very least, counterfeiting of IP under TRIPS could be equated with biopiracy. CBD recognises collective rights of local communities over their biodiversity but TRIPS seeks to impose private intellectual property rights over the same. Which of these rights comes first is not settled. The right to life for all life forms is implicit in the definition of biodiversity as "the variability among living organisms from all sources[19]. A basic principle of CBD that *in situ* (local) conservation of biological resources is more

[18] *See the statement of concern expressed by the representative of the Secretariat of the Convention on Biological Diversity (SCBD) at the 5th session of the WIPO IGC (July7-15, 2003) at WIPO/GRTKF/IC/5/15, p.8 paragraph 20.*

[19] *India' s Biological Diversity Act, 2002 goes further by including ecological complexes of which living organisms are a part and includes diversity within or between species and of eco systems [Article 2(b)] but its major weakness is that it does not cater for marine resources.*

sustainable than *ex situ* (gene bank) conservation is put at risk by the rights and incentives in TRIPS. An access and benefit-sharing regime outside IP laws is not enforceable without the obligation of disclosure in patent applications and penalties for non-disclosure (such as declaring a patent *ab initio* void).

Fair and equitable access to genetic resources, subject to prior informed consent is governed by Articles 15.5 and 15.7 of the Convention on Biodiversity (CBD), enjoined with an obligation under Article 16 for concessional and preferential transfer of technology. The CBD asserts that IPRs must not conflict with the conservation and sustainable use of biodiversity (Article 16.5) but no limits are mentioned in TRIPS. It is anathema to practitioners, policy-makers and researchers on WTO and TRIPS to be reminded of the CBD. A claim is frequently espoused that TRIPS is the only international agreement that matters as if other international agreements are somehow subordinated to it. It is also heard in some quarters, that CBD is not universal in application, particularly because the US has not ratified the CBD.

If CBD is not universal, neither is WTO[20]. WTO has 146 members. CBD has been signed by 157 countries. The crux of the matter is that WTO has a dispute resolution mechanism but Annex II Article 27 of CBD lacks effective international arbitration. CBD predated TRIPS and could not have anticipated TRIPS in its provisions. However, TRIPS is silent on CBD which has caused concern among many who regard the two as partially incompatible[21]. The disclosure of origin and prior informed consent as principles follow logically from the obligations undertaken by parties to the CBD but TRIPS does not detail specific and binding international commitments in this regard despite considerable interaction between rights created by the TRIPS agreement and the subject matter of CBD. CBD has neither participant nor observer status in the TRIPS Council. If WIPO were to adopt CBD guidelines as the basis for GR-related IP, that would conflict with

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[20] *About 75 countries, including Russia, are not members of WTO.*
[21] *For a comprehensive discussion on the conflict between TRIPS and CBD, see* http://www.iccwbo.org

TRIPS rights. The inability of WIPO to do so leaves CBD unimplementable because of the incentives packaged in TRIPS rights.

Article 8j which deals with *in situ* conservation reads:

"*Subject to its national legislation each contracting party shall respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices*"

Under this article of CBD, TK should be respected, preserved and maintained;its application promoted with the approval and involvement of holders and its utilization should lead to equitable sharing of benefits. Distinct ways of using IP tools are therefore necessary so that IPRs do not undermine TK holders' interests. But TRIPS does not give TK holders the minimum entitlements needed to enforce their interests. If we read this provision together with Article 10 c *' to protect and encourage customary use of biological resources in accordance with traditional cultural practices compatible with conservation or sustainable use'* this entails protection of TK in ways that are under or enmesh with IP regimes such as TRIPS, and also promotion of rights in traditional knowledge. One way of doing this would be to institute *' sui generis* elements in existing IP systems in their application to TK subject matter. Another way would be to institute stand-alone *' sui generis* IP systems for the protection and promotion of both content and manifestations of TK. A third way would be to simply challenge any country' s IPR regime on the ground that it fails to give adequate protection to TK and is thus in violation of Article 8 (j) of CBD.

The TRIPS agreement does not envisage any procedures or tools to establish links between intellectual property protection and compliance with the principles of CBD such

as regulation of access to genetic resources, prior informed consent, declaration of origin and benefit sharing. There is also no linkage to non-IP regimes. Biological resources are exhaustible and don't become necessarily sustainable if there are no IP conflicts. The rights and obligations of CBD have not been operationalised in TRIPS and barriers to their being operationalised outside TRIPS have been erected by limiting the scope of binding responsibilities to TRIPS.

Article 15 (3) of CBD makes it clear that "*the genetic resources being provided by a Contracting Party are only those that are provided by Contracting Parties that are countries of origin of such resources or by the Parties that have acquired the genetic resources in acordance with this Convention*"

Countries are thus free to legislate protection for the rights of indigenous people and local communities. A special and different measure adopted by a developing country would not amount to discrimination under Article 27.1 of TRIPS because the exclusive rights under Article 28 and the non-discriminatory clause in Article 27 cannot be considered separately but are to be construed as part of the overall WTO schema[22]. However, no international safeguards exist and CBD runs the risk of being coopted by commercial interests. The discussion on rights to IPR protection is being substituted with discussion on access and benefit-sharing regimes (ABS) emphasising codes of conduct to help corporations access knowledge about communities' biodiversity. This encourages buying off individuals to appropriate collectively held resources. The imbalance can be corrected in two ways. CBD can be made more supportive of IPR systems by standardising ABS regimes but this solution is likely to create further incentives to exclude people from the management of their biodiversity. The alternative is to amend TRIPS or at least clarify rules and limits to patentability under TRIPS.

[22] *This would be consistent with the Vienna Convention on the Laws of Treaties, 1969 that the principle of effective interpretation requires that one provisionof a treaty cannot be given an interpretation that renders another provision of that or some other treaty redundant and otiose.*

Due to the existence of Article 27.3 (b) in TRIPS, biodiversity falls firmly under the legal regime of TRIPS. Article 27.3 reads: "Members may also exclude from patentability plants and animals other than microorganisms, and essentially biological processes for the production of plants and animals other than non-biological and micro-biological processes. **However, members shall provide for the protection of plant varieties either by patents or by an effective sui generis system**…. " (emphasis, in bold letters, mine). The precise meaning of ' effective*sui generis* system' is unknown. Scholars and policy-makers assume that this refers to some form of plant varieties protection (PVP) at the national level. However, PVP is known to be a legal incentive to breed uniformity and restrict the rights of farmers and local communities concerned with biodiversity[23]. Thus, here, the aims of TRIPS clearly conflict with CBD.

It was obvious when TRIPS was being drafted that the above-mentioned clause would require some variant of UPOV inspired PVP to be adopted by individual countries instituting a system of private rights over collective ones. Genetic uniformity is a condition precedent to monopoly rights. Neither the patent system nor the PVP system has any mechanism for sharing benefits between IPR holders and germplasm/TK holders/providers[24].

In making plant breeders' rights universal, TRIPS made no reference to the CBD nor to International Union for the Protection of New Varieties of Plants (*Union Internationale pour la Protection des Obtentions Vegetales*, known by its French acronym, UPOV). According to Watal (2001) this hiatus arose because UPOV (1978) was obsolete at the time and UPOV (1991) not in force, hence premature ! Although UPOV (1978) is not compatible with TRIPS because it doesn't require all plant varieties to be protected, there

[23] *There is overwhelming evidence from countries where PVP has been in effect for decades that such protection reduces information and germplasm flows from the private to the public sector reducing the role of public plant breeding and causes unprecedented loss of control over biodiversity (RAFI, 1995; Kothari and Anuradha, 1997).*

[24] *According to WIPO, citizens and companies of industrialised countries hold 95 percent of the patents in Africa, about 85 percent of those in Latin America and 70 percent of those in Asia. By reuiring developing countries to implement a regime of private property rights on their own biodiversity and traditional knowledge for the benefit of companies in the industrialised countries is nothing short of perverting the very objectives of CBD (See WIPO data set WIPO/IP/STAT/1994/B published in November 1996).*

is nothing in TRIPS to stop a country from legislating its plant varieties protection legislation mainly on the lines of UPOV (1978) provided the national legislation caters to plant breeders' rights (PBRs) alongside farmers' privileges (FP) in order to be TRIPS compliant. The strengthening of PBRs, dilution of FPs and the departure from reciprocal treatment to national treatment are the main outcomes of UPOV (1991). Double protection under patents and PVP is not excluded, and a few countries have permitted patenting of plants and animals. It remains an open question whether genetically engineered plants patented in a jurisdiction would include plant varieties within its scope.

Articles 16 and 19 of CBD explicitly catered for access to transfer of technology to developing countries "*under fair and most favourable terms*", especially for biotechnological research activities. TRIPS makes no reference at all to biotechnology, but includes IPR protection of life forms in Article 27.3 (b) of TRIPS.

Article 16 (5) of CBD states that countries should cooperate to ensure that patents and other intellectual property rights "*are supportive of and do not run counter to the objectives of the CBD"*. Establishing a link between the framework of the CBD with the norms of disclosure of a patent application in the TRIPS agreement is aimed at ensuring that patents are not granted or get invalidated, if granted in violation of the rights of the countries/ communities over their resources/knowledge. Such a provision would be in consonance with Section 7 of TRIPS which emphasizes that '*the protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation…to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations'*. In fact, Article 22 of CBD reinforces Article 16(5) of CBD because it states that the CBD "*shall not affect the rights and obligations of any Contracting Party deriving from any existing international agreement, except where the exercise of those rights and obligations would cause a serious damage or threat to biological diversity*" (underlining, mine)

Apologists maintain that requiring different norms of disclosure for certain patents would not be consistent with the TRIPS agreement because it would violate the principle of non-discriminaton between fields of technology and this is the position taken by the US on this issue (see IP/C/W/257 at http://www.wto.org). This interpretation is not maintainable because there would be discrimination only if the three criteria of patentability (novelty, inventiveness, usefulness) are applied differently to different fields of technology. Different norms of disclosure in a procedure do not constitute discrimination. Biopiracy is internationally acknowledged (UNDP, 1999). It is necessary to verify 'inventiveness' and, for this purpose, procedures can be different for different fields of technology. Such a condition does not involve any unnecessary burden because the applicant would already have this information. The doctrine of inequitable conduct must be treated within the patent system. Documentation of TK to aid 'prior art' search cannot solve this problem, h because TK is vast and also because such a requirement would involve loss of confidentiality for undisclosed data not in the public domain. Access and benefit regimes in one country cannot be a solution because they are powerless to hinder misappropriation for patenting in another country. Several advanced countries have not yet amended their patent laws to comply with Article 31 of TRIPS, leaving the conditions and requirements flexible for them but not for developing countries. Decisions on compulsory licensing in the European Court of Justice pointed to several lacunae in the intital TRIPS texts [25].

The absence of national systems in developing countries to deliver certificates of evidence of approved access was the reason cited by the EU for its opposition to the Cancun Declaration (18.2.2003) by like -minded mega-diverse countries (Brazil, China, Colombia, Costa Rica, Ecuador, India, Indonesia, Kenya, Mexico, Peru, South Africa, and Venezuela)[26] seeking the creation of an international regime to "*certify legal provenance of the biological material, prior informed consent and mutually agreed terms for the transfer of genetic material as requirements to the application and granting*

[25] *Article 5A of the Paris Convention and Article 46 of the European Patent Convention were added to TRIPS to clarify the working of patents and its equivalence to importation.*
[26] *These 15 mega-diverse countries hold more than 75 percent of the world' s biodiversity.*

of patents, strictly in accordance with the conditions of access agreed by the countries of origin".

Articles 7 and 8 of TRIPS need to be operationalised to provide for transfers of technology on fair and mutually advantageous terms. Article 27 (2) which provides for some exceptions to patentability enables WTO to function as the authority to examine, interpret and decide what would constitute serious prejudice to the environment but the environment is legislated separately under UN environment programme and CBD. Article 27.3 (b) of TRIPS needs to clarify artificial distinctions between biological and microbiological organisms and processes and be explicit on cultivators' rights.

The conflict between TRIPS and CBD over rights to biodiversity cuts deeply into both treaties forcing parties to decide which should take precedence over the other. The uniform legal regime of TRIPS aims to provide private equal property rights over products and processes, be they biodiversity based or not, and regardless of whether they impair biodiversity objectives. TRIPS nullifies the proposition that IPR on biodiversity-related patentable inventions can be (and frequently are) dependent on pre-existing rights to biodiversity and associated knowledge protected as community rights under CBD. By disguising and limiting the meaning of novelty to technical contexts, the implementation of TRIPS systematically undermines the rights and wider historical contribution made by communities in developing countries for the planet' s biodiversity, in complete conflict with the system of rights detailed in CBD. The CBD and TRIPS create a conflict of obligations too. Within a country, the state' s sovereignty takes precedence and CBD must prevail. However, IPRs could be created by TRIPS in contravention of equity, in breach of rights of communities protected by the State, without a requirement of disclosure of origin, prior informed consent, authorised access and benefit sharing in external jurisdictions where IPR holders cannot effectively be countervailed. Thus, TRIPS negates the benefits provided by CBD for the use or exploitation of genetic resources and traditional knowledge. CBD gives legal authority to States to make rules to reduce biopiracy while TRIPS ignores this authority and indirectly promotes biopiracy. CBD

places the public interest and common good over private property rights and vested interests. TRIPS does exactly the opposite.

At present, CBD is unable to prevail over TRIPS in the area of biodiversity and traditional knowledge. WTO enables cross-border trade in traditional knowledge, genetic resources, and folklore converting local and national commons into functioning as global commons, *de facto,* without the force of any *de jure* sanction to implement global policies or international agreements on transfer arrangements. Brazil, China, Cuba, Dominican Republic, Ecuador, India, Pakistan, Peru, Thailand, Venezuela, Zambia and Zimbabwe made a submission to the TRIPS Council on the relationship between the TRIPS Agreement and the CBD and the protection of traditional knowledge under paras 12 and 19 of the Doha Ministerial Declaration urging an amendment of the TRIPS agreement regarding patents relating to biological materials or traditional knowledge requiring

(a) disclosure of source and country of origin of the biological resources and of the traditional knowledge used in an invention ,

(b) evidence of prior informed consent through approval of authorities under the relevant national regime, and

(c) evidence of fair and equitable benefit sharing under the relevant national regime.

The disclosure requirement under Article 29.1 of TRIPS merely requires ' a person skilled in the art' to put the invention into practice. The geographical origin may or may not be one of the relevant elements of such information because it doesn't constitute a patentability criterion under Article 27.1 of TRIPS. It is noteworthy that following TRIPS, the EU Directive 98/44 does not make disclosure of origin a binding requirement for biotechnology innovations. The need for a self-standing disclosure requirement as a criteria for a patentability has been left unaddressed.

The ILO Convention No. 169 on Indigenous and Tribal Peoples (adopted in June 1989 and in force since September 6, 1991) was aimed at promoting respect and participation for the culture, spirituality, social and economic organization, identity and enduring nature of indigenous and tribal peoples[27]. This Convention provides rights to indigenous and tribal peoples to participate in decision-making processes, to observe customary laws, to self-determination, and to control over their own economic, social and cultural development (Articles 6 and 7). One of the most important provisions of this Convention is the one dealing with land rights and rights to their natural environment. The agreement has been ratified by Argentina, Bolivia, Brazil, Colombia, Costa Rica, Denmark, Dominican Republic, Ecuador, Fiji, Guatemala, Honduras, Mexico, Netherlands, Norway, Paraguay, Peru and Venezuela. The only mega-diverse countries who are yet to ratify this new Convention are China, India, Indonesia, Kenya, and South Africa. This Convention is complimentary to (and to be read with) Article 12 of the International Covenant on Economic, Social and Cultural Rights which enjoins member States to recognise the right of everyone to enjoyment of highest attainable standards of physical and mental health and Article 25 of the Universal Declaration of Human Rights that proclaims the right of everyone (including local and indigenous marginally subsisting peoples) to health and medical care. As previously noted, for many such people, traditional medical systems are mainstream healthcare systems, not alternative medicine. Thus, their rights over plant genetic resources cannot be obscured in the desire to strengthen private property rights to innovations based upon traditional knowledge.

It is widely acknowledged that the principle of equity dictates that a person should not be able to benefit from exploiting IPRs based on genetic resources or associated knowledge acquired in contravention of any legislation governing access to it[28]. The key issue is the enactment of such legislation and enabling mechanisms that would govern market and

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[27] *This Convention is an improved version of ILO Convention on Indigenous and Tribal Populations 107 ratified by India and 26 other countries*

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[28] *See the Barton Commission' s report 'Integrating Intellectual Property Rights and Development Policy', sponsored by DFID, UK, September 2002, at http:// www.iprcommission.org/papers/text/final_report . The Commission' s Chapter on Traditional Knowledge has no concrete recommendations or proposals for its protection except exhorting the need for a ' sui generis' system.*

non-market allocation of resources, when development and appropriability of a resource presents strong externalities.

6. IS TRADITIONAL KNOWLEDGE A PUBLIC GOOD?

Missing markets cause spillovers across borders and present strong externalities.The profound implications of under-use or over-exploitation to the point of exhaustibility raises inter-generational and spatial equity dilemmas. These imperatives point to the need to examine whether traditional knowledge and genetic resources have public goods characteristics. This would help determine conditions under which non-excludability, non-rivalrous consumption and sustainability may be achievable locally and nationally or only globally. If so, there may be a case for treating traditional knowledge as a global public good. Sen (1999) highlights the constraints, viz. that cross-border equity is an intergovernmental issue, intra-national equity remains a matter for public policy while social choice in national jurisdictions and a global society where equal worth is assignable to all persons within a living generation regardless of borders has yet to emerge.

Biodiversity as "*the variability among living organisms from all sources including, inter alia, terrestrial, marine and other acquatic ecosystems and ecological complexes of which they are a part and diversity within and between species and of ecosystems*" (CBD Article 2, para 1) is both public and private good. The loss of genetic information and the fragmentation of habitats diminishes the world's genepool-an intergenerational public good.

Few reliable estimates exist of the value of biodiversity. Market prices are an unreliable resource allocator because the relationship between a conserved species and its ecological benefits is not specified in any production function. Rosenstein-Rodan (1943) and Egon Matzner (2000) are among economists who concede that pricing experiments have neither prevented species extinction nor stopped deforestation. The global public benefits of emergency prevention of species extinction in biodiversity hotspots targets the bulk of

Global Environmental Facility Funds to forest systems. However, incentives are also needed to protect other local habitats where environmental resources are put to stress every day. The legal recognition of local communities as legitimate managers of local habitats may be possible if resources can be mobilised at the local level or provided through resource transfers. [29]

Lost biodiversity and new treatment innovations made possible by the combination of biotechnology and traditional knowledge are both inter-generational public goods (Sandler, 1999). The more the number of people affected, the higher the value of such a good, but current prices merely reflect the operation of demand and supply of its elements within a specific group of currently living people.

A standard inference from the theory of public goods is that in the presence of externalities, the existing set of markets fail to ensure allocative efficiency (Newberry, 1989). Allocative inefficiencies can persist even if futures markets were to exist when one set of actors (bioprospectors) are concerned with price insurance and another set of actors (traditional knowledge holders) with income. Wicksellian voting organised on the basis of 'one country one vote' can neither finance the supply of traditional knowledge as a public good nor can it set a level of supply. Global public goods are negotiated outcomes rather than ' goods' . When public goods are local with global externalities, it is mainly upto the localities (communities and countries) to offer a menu as a Tieboutian solution (Tiebout, 1956). Such a solution is warranted because market mechanisms may not lead to a sensible allocation of exhaustible resources that are cared for (or neglected) in specific locations.

The relationships between externalities, appropriability and excludability are central to the theory of public goods. An analysis of externalities can be a first step in the search of criteria for non-market resource allocation. However, there are reasons to be cautious and not be tempted to set forth such criteria in terms analogous to financial profit and loss

[29] *Pilot projects in the State of Orissa, India have shown that recognition of local public goods as national and global public goods can be an effective way to conserve biodiversity (Perrins and Gadgil, 2003).*

analysis because (a) contributions to public goods may be individually unprofitable though collectively worthwhile, and (b) market failure is a more general problem than externalities relative to a mode of economic organisation (Arrow, 1970). Moreover, the costliness of information to enter a market under different systems of access varies and can itself be prohibitively excluding.

Traditional medicinal knowledge is sourced from a bundle where traditional knowledge and plant genetic resources are intertwined before relevant know-how is extracted and developed in the cause of biotechnology and biopharamaceutical innovations. It is therefore pertinent to view organic and informational resources, separately and together, with reference to sustainability and public goods characteristics as depicted in Figure 4 .

Figure 4 TKGR AS PUBLIC GOODS

	RIVALROUS	EXCLUDABLE	EXHAUSTIBLE
ORGANIC RESOURCES	**YES**	**?**	**YES**
INFORMATION RESOURCES	**NO**	**?**	**NO**

Informational resources are neither exhaustible nor rivalrous in consumption (in a normative sense). Access can be structured in non-excludable ways. However, articulated forms of knowledge and their parcels in databases can be owned under IPRs, to third party exclusion. In such cases, knowledge ceases to be a pure public good and there is a case for the creation of a global knowledge commons as a ' club good' distinguishable from public domain[30]. A bundle of excludable organic resources, with unexcluded informational resources constitutes an impure public good. Capacity building with State

[30] *The case for 'sui generis' protection of traditional knowledge can be regarded as a special case of this idea. Stiglitz condemns the practice that the"discoverer" of a patentable drug should walk away with all*

intervention or incentive support for impure public goods or private goods are difficult to structure because the market enables actors to structure risk through Coasian solutions, transfer pricing, forward markets and other instruments in ways that the holistic nature of the original problem is both segmented and fragmented.

Organic resources are rivalrous in consumption and also exhaustible. Barriers of access to plant genetic resources after the Rio Treaty (CBD) made them excludable under sovereign jurisdictions. Questions have also arisen whether natural resources belong to people or to governments and these remain unsettled. If 'yes' is posted in all the boxes in the 'organic resources' row in Figure 4, they would not qualify as public goods, regardless of whether they are owned by governments and licensed or traded on the basis of assignment and reassignment of private ownership rights.

The assumptions underlying valuation of TK of both 'contemporary' and 'non-contemporary' types must take into consideration that traditional knowledge cannot be protected as a public good in national jurisdictions without first being protected as a global public good. Such a logical solution is unachievable because natural resources have been partitioned and derogated by the Rio Treaty. Unless that were to be reversed, it would be more useful to examine the relative significance of tangible and intangible elements in the bundle with reference to the contemporary or non-contemporary nature of the resource as in Figure 5 (which is a general form corresponding to the specific example in Figure 3).

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the credit and associated private gains on a winner-takes-all basis if the innovation is built on pre-existing traditional knowledge (Stiglitz, 1999).

Figure 5 PRODUCT-SERVICES LINKAGES

	CONTEMPORARY	NON-CONTEMPORARY
TANGIBLE	BIOTECH/PHARMA/AGRO/ CHEMICAL PRODUCTS (TRADE)	BIOHERITAGE (BENEFIT SHARING)
INTANGIBLE	IPR SYSTEM "UTILITY"+"NOVELTY" +"INVENTIVE STEP" (DISCLOSURE)	TRADITIONAL KNOWLEDGE (PRIOR ART)

Of the four categories in Figure 5, the valuation of contemporary tangibles presents the least difficulties because this can be left to forces of supply and demand in the market-place. With few exceptions for non-tariff barriers, trade in goods is well established through WTO regimes. The risk that plant genetic resources could be commodified into this space from utility space calls for government regulations. For instance, China recently classified plant genetic resources into categories that may not be plucked at all, categories which may not be sold, those that may not be exported, others that may be exploited only by the Chinese public sector, yet others that may be exploited by Chinese firms, and some that may be exploited by anyone with a license etc[31]. Such a conservative approach automatically protects non-contemporary tangibles that constitute a part of bioheritage. Biodiversity laws of a number of countries aim to achieve the same result through similar legislation.

The main problem lies in the intangible categories because the valuation of intangible assets can show up a considerable divergence between economic value and commercial price, and also between notions of price, including oligopoly profits, and price including variations of imputed normal profits in less than perfectly competitive markets. A part of

[31] *The Chinese Wild Plants Protection Regulation came into force on January 1, 1997.*

the problem arises from differences in the way in which accounting treats costs and projections of costs (historical costs, trend estimates, assets at market prices, depreciation) from how economists view costs (opportunity costs, sunk costs, dynamic modelling). To put it simply, when incentives are designed in public policy choices, the emphasis is on correcting information asymmetry and improving contract enforcement with dynamic effects in mind. In contrast, microeconomic estimations assume inefficiencies in public policy interventions and focus on static effects, internalising only the probable positive spillover effects.

These approaches, for their different objectives, work well when the focus is on the microeconomic valuation of tangibles. However, when we turn to the economics of innovation, involving intangibles or bundles of tangibles and intangibles where the intangible elements are much more valuable than their tangible elements, the cost and benefit streams exhibit departures from properties of convex functions.

In relating the capturable production value of an active ingredient to the expected production value of a patented end-product, it has been customary to impute a value (less than unity and usually close to zero) to the fraction by which the expected production value of a patented end-product is multiplied to arrive at the capturable value (Mathur, 2003a). This is based on the logic that search among, say, a hundred plant species, may reveal ten promising lines of inquiry, and only one of these may be developed into a therapeutic molecule. Using this logic, some scholars have tried to introduce marginal analysis to price the value of land on which a species may face the threat of extinction. According to them, substituability between species is either too high or too low (they are not sure which is the case!) to be of economic significance. Such reasoning has been used to develop mathematical models that put the value of biodiversity to between $ 0.02 per hectare (in California) and $2.29 per hectare (in Western Ecuador) in the eighteen biodiversity hotspots of the world (Simpson, 1997). Such reasoning is fallacious for a number of reasons. It misses the essential point that the discovery of a single active therapeutic ingredient generally leads to multiple uses, and its combinations, permutations, mutations may lead to hundreds of patented end-products (157 in the case

of Neem). Moreover, the rate of extinction is presently more than a thousand times greater than the natural rate of extinction in the last two millienia. The problem is not about ensuring quantities of life forms-it is about the variability among living organisms viz.biodiversity. If a commodity price is low in reckoning, under abundant supply assumptions at a point in time in evolution, does that tell us anything about its importance to justify the disappearance of a bird, animal, tribe or microorganism ? [32] Prices reflect the present order in terms of what a good is worth to the marginal buyer, without consumer surplus. Prices can tell us about the value of having a little more or a little less but not about having a lot less (Heal, 2002)[33]. There are no markets for services provided by natural ecosystems and although it is possible to impute some value based on the benefits that accrue to market transactions concerning them, such market prices are a lower bound estimate which do not reflect the total value to society. Externalities are a source of non-convexity and prices are known to give wrong signals in the presence of non-convexities, directing the economy away from the social optimum (Hotelling, 1931; Portes; 1970; Starrett, 1972; Bradford, 1972; Baumol and Oates,1988).

The value of the multiplier referred in the above discussion is directly related to the probability that a source material has previously known properties and uses and also to the variety of such uses. This is where access to traditional knowledge and the pattern recognition skills honed over a long period of time can cut both time and costs. While it is true that a hit and trial approach based on linear thinking and linear-thinking based logic of an analytic kind with number crunching aided by powerful computing technologies can result in exhautively analysing possibilities, quicker and more decisive results can be obtained by improving the search methodology with human intervention,

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[32] *To quote Ricardo, "The labour of nature is paid not because she does much, but because she does little. In proportion as she becomes niggardly in her gifts, she exacts a greater price for her work. Where she is munificently beneficient, she always works gratis" (Ricardo quoted in Heal, 2002, p.185).*

[33] *According to Heal, "there have been no convincing studies of the economic value of preventing the loss of significant parts of any global life-support systems" (Heal, 2002, p.192). According to Heal, the rental price of land in tropical forests for carbon sequestration alone should lead to payments as high as $ 150 per hectare per year.*

through an understanding of traditional knowledge. This would enable a more realistic *ex-ante* valuation by economists, closer to the *ex-poste* calculations of accountants.

7. THE VALUATION OF TRADITIONAL KNOWLEDGE

There is considerable controversy over the value of traditional knowledge. The valuation of the subset of traditional medicinal knowledge has attracted the most attention. This subset requires plant genetic resources to be valued together with intangible assets in the form of local knowledge. It is true that local communities and countries, with few notable exceptions, have not earned much from their plant genetic resources[34]. It is also widely believed that controlling access is neither desirable, nor effective. Estimates made in developed countries have assumed that the methods of drug discovery are largely technology driven and that the value of fragments of biodiversity hotspots in pharmacological research is not much more than a few cents per hectare (Simpson, 1997).

With the advent of blue gene genomic technologies, advances in proteomics, combinatorial cytochemistry, and the expansion of patent protection and plant varieties protection, the valuation of plant genetic resources tied to traditional knowledge deserves to be reexamined. Prior informed consent cannot be operationalised without valuation because resources cannot be found, let alone allocated, without *a priori* estimation of trade potential.

The EU Trade Commissioner Pascal Lamy, in his conversation with me during the course of a consultative meeting between EU and India in New Delhi on January 19, 2004 publicly acknowledged that traditional knowledge has high potential whose magnitude is unknown, but the EU' s commitment of resources for valuation of traditional knowledge and estimation of trade potential has not been forthcoming[35].

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[34] *The same could be said of biotechnology investments and subsidies by governments almost everywhere (exceptions are U.S.A. and Ireland)*

[35] *See the EU' s refusal to amend Article 27.3 b of TRIPS in its communication dated September 12, 2002 to the TRIPS Council on the protection of TK and the relationship between TRIPS and CBD. Action 26 in EU' s Action Plan on Life Science and Biotechnology is a unilateral statement ofntent which falls short of a multilateral commitment within the WTO framework.*

There is hesitation to reopen Article 27.3 (b) of TRIPS to introduce CBD obligations and restore balance in the assymetry of information, bargaining power and resources between traditional knowledge holders and patent applicants. It appears that the US and EU are unwilling to jeopardise their Uruguay round gains from TRIPS by reopening its provisions for negotiations. Both are in a comfortable position to consolidate the gains through protection-enhancing technologies and take recourse to the dispute settlement process of WTO as a more effective means of perpetuating the imbalances. Assessments, estimations and valuations of traditional knowledge by developing countries are therefore even more important to increase awareness and mobilise support for resource allocation into competitive biotechnology skills, biodiversity conservation and *sui generis* protection for traditional knowledge. India and Brazil have demanded the institution of *sui generis* protection for traditional knowledge at the WTO.

Traditional knowledge can have value also as undisclosed information which is protected in certain national jurisdictions or covered by civil law rights or common law provisions. Such protection has limitations that arise from hindrances in cross-border commercial exploitation through trade in services except through foreign commercial presence (feasible, only with scale) or the movement of natural persons (providers and recipients), and the known hazards of independent disclosure and leakages. There are enormous difficulties associated with the marketing of unfamiliar knowledge and skills about which people are ignorant. Foreign authorities may not sanction the practice of a trade or a profession, where standards, benchmarks, norms do not yet exist.

Copyrights and related rights are limited to expressions. Unarticulated or tacit traditional knowledge cannot be so protected. Similarly, while commodified products of artisans or craftsmen may be protected under trade marks, or geographical indications and as designs, services (skill-based and knowledge-based) cannot be protected against imitation. There is no bar to their production by others, as long as a specific trademark or a geographical indication is not infringed. New products and services sourced from TK can easily be swamped by branded imitations offering the same benefits. Among the most

significant features of traditional knowledge are pattern-recognition skills and the logic underlying such skills which are not easily amenable to protection under conventional forms of formal IPRs. Textile designs and their combinations which are expressible can be in wide circulation. It is problematic to protect these under copyright or design IPRs in first-to-file systems that accord no priority to first-to-invent or first-to-use. In film media, loss-making movies are released in the pirate market to recover costs. TK piracy offers similar static gains to owners and conduits who take advantage of informal porosity.

The economic analysis of costs and benefits of IPRs has attracted some research attention (Maskus, 2000). Questions of economic valuation of intangibles inextricable from tangibles in cases where the divergence between *ex-ante* and *ex-poste* calculations is predicated on as-yet-unformulated access and benefit sharing regimes in missing markets have remained an enigma. Curiously, valuation is a basic condition for the practical design and application of incentive measures in the valuation of TK and genetic resources, including biodiversity. Valuation would enable new markets to be created and existing markets to function better. It is also a way to secure sustainable development of long term tangible and intangible benefits and reduce uncertainties for investment and trade [36].

The valuation of TK needs to address the following aspects:

(a) Direct use value observed in the pursuit of static efficiency.

(b) Indirect use that supports economic activity and sustains livelihoods in the locality, and elsewhere.

(c) Discounted present value of future uses, subject to uncertainty, future demand or availability (including the question of exhaustibility).

[36] *Coconut fibre which used to be previously burned as waste in the Amazon forests found uses through valuation, saving also the surrounding rubber trees (See UNEP Document UNEP/CBD/SBSTTA/7/11, p.12).*

(d) Non-use value which is the existence value or bequest value in economic, social, cultural, aesthetic, intrinsic, ethical or spiritual terms.

(e) Positive and negative externalities, spillover effects for knowledge, innovation, organisation, partnerships, supply side adjustments etc.

Valuation of traditional knowledge and plant genetic resources is the key to structuring access and benefit-sharing regimes. The discussion on valuation continues in the next section contextualising it for the purpose of constructing access regimes and benefit sharing.

8. ACCESS AND BENEFIT-SHARING REGIMES

Typically, IPRs are designed against commercial exploitation by unauthorised third-parties. Novelty thresholds vary across different patent jurisdictions, and 'due diligence' during prior art seacrhes does not require patent offices to search for anything undocumented or inaccessible to them. It has been suggested by some scholars and policy-makers that traditional knowledge may not be misappropriated under IPRs if it were to be documented and made available to patent offices.

There are three reasons why such a strategy has severe limitations:

8.1 Firstly, traditional knowledge is not a product. It is part of living traditions and processes, where ideas are embedded in praxis. The forcing of a 'procrustean bed on an ameboid phenomena' (to quote an expression used by Viswanathan, 2001) would involve incision and invasive surgery of a kind that can irepairably damage, the very sources of nurturance that enabled such knowledge to be cared for and fed inter-generationally.

A crucial question for valuation and development of traditional knowledge has been raised by Banerjee (2004) in the context of globalising Ayurveda. She asks whether world-views inherent in the living knowledge traditions of non-contemporary knowledge

systems are cognizable only when codified and incised or when products are commodified from their utilty space. To do so for Ayurveda entails the risk of marginalisation and downgrading of a medical system into a rudimentary form of herbal medicine distanced from biomedicine. Banerjee's call for focusing on 'treatment entities' rather than 'drugs' finds an echo in the search for alternatives (Whitelegg ,1997) and in recent declarations on healthcare by the WHO (2002). If reduction in disease burdens rather than increases in healthcare expenditure per capita is the criteria of evaluation, the efficacy of alternative medical systems would be properly compared (Mathur, 2003b).

The wisdom of the '*vedas*' captures this ethic succinctly. The*v'edas*' are an attempt to circumscribe knowledge that cannot be limited to boundaries or contained within containers i.e. reducible to discrete articulations and magnitudes.This is why the oral ('*shruti')*tradition was used to enable contemporary relevance to inform and update knowledge being received and passed on for eternity. To canonise the vedas is akin to confining living traditions of knowledge creation into a jar of formaldehyde for the sake of manipulability by instruments for better examination.

8.2 The vast treasure trove of traditional knowledge is practically infinite. It would be impossible to ever articulate it completely through documentation. This is apart from the hazard of subjecting it to limiting and limited frames of inquiry in specific modes and contexts in the process of doing so (that may actually destroy more knowledge than ever gets documented). A laudable initiative in this direction is the creation of the world's first traditional knowledge digital library by India. However, even the documentation of Ayurveda is not yet complete, and other systems of medicine like Unani, Siddha, etc. are not yet begun. The main value added in this venture is the creation of an inquiry algorithm that enables a patent examiner to conduct 'prior art' searches in six different ways, including the use of terms in the international classification of diseases (ICD-10) or botanical latin names of plant species.

8.3 IPR economics is national and global. Any defensive measures, even if effective, cannot guarantee a flow of benefits to identifiable sources of such knowledge. That

would require proactive solutions for access and benefit-sharing and the politics of access and benefit sharing is local.There is the additional problem that the same traditional knowledge can be claimed by more than one locality For example, Ayurveda is practised in North India where it originated but is also practised in Kerala and elsewhere, with novelties being introduced all the time. A digitalised database of any kind of traditional knowledge is copyright protectable but the data itself is not so protectable.

The design of traditional knowledge digital libraries can certainly aid prior art searches if they are interactive archives but the ownership of such archives is fraught with considerable complexity because it can involve ownership claims from the codifiers, software programmers, governments, sponsors, partners, parastatals, consultants and researchers involved, non-governmental voluntary agencies, aid organisations, banks and credit finance institutions etc. to the exclusion of the holders. Moreover, the databases so created are also a tradable resource. There is always the risk that public or private monopolies will eventually claim rights to them without an iota of benefit-sharing with the traditional knowledge holders and practitioners.

Thus, defensive measures such as digitalisation of traditional knowledge, while necessary and desirable in certain respects, are not at all sufficient, in themselves without an enabling framework on access norms and benefit-sharing. The challenge to harness them to spur innovation remains.

Despite the absence of any legal basis for benefit-sharing in TRIPS, a variety of experimental models to reconcile formal and informal property rights have been tried in many countries[37]. The most common scheme is a multi-party contract-type solution involving the developer of the idea/resource, the country and locality of origin, and commercialisation licensing based on prospective benefit sharing, transfer of technology and replenishment of biodiversity.

[37] *See Roht-Arriaza (1996) for pitfalls of benefit-sharing arrangements surveyed by her.*

Some countries have introduced legislative measures to strengthen the legal rights and property rights of indigenous and local communities over their traditional knowledge and local innovations. Yet others have created national and regional authorities and mandated rules for bioprospecting by bringing such resources, including informational resources under government control.

Although the challenges are similar, the focus of national initiatives to safeguard against biopiracy and biopower, or promote biodiversity and protect traditional knowledge varies widely. Some countries are content with the preservation of oral traditions as part of culture and their national laws are oriented to cater to preservation of cultural traditions. Others, like Kenya, protect traditional knowledge under industrial property laws with a view to link cultural evolution with economic incentives. Yet others like Costa Rica have surrendered their biodiversity to private biopharmaceutical firms (in the case of Costa Rica to Merck for a mere $ 586,000 per annum).

China, India, Brazil, Peru, Venezuela and the Philippines have promoted national innovation systems. In Cuba, a law on access and benefit sharing is in place which covers genetic resources and TK with a requirement of prior informed consent. Philippines has legislated indigenous people's rights and created a plant genetic resources database of more than 45, 000 species to give teeth to its plant varieties protection law. Srilanka and Thailand have preferred to use plant varieties protection laws as the means to invoke 'prior informed consent' and 'disclosure of origin' conditionalities. Japan has opted for utility models whereas the Andean Pact countries (Colombia, Venezuela, Peru, Ecuador, Bolivia) are the first in the world to introduce rules for access regimes and benefit models for bioprospecting.

Scholars have proposed the creation of new institutionalities to broker deals between buyers and sellers of genetic resources such as creation of a Global Biocollecting Society (Drahos, 2000). Grassroot innovation facilitation through registries linked with venture capital incentives are functioning in countries like India [see, for instance, the honey-bee network, GIAN and SRISHTI which have documented and protected local innovations in

what is probably the world's largest collectively held repository of patentable local innovations (http://www.gian.org/).

As previously noted, the main problem in the valuation of traditional knowledge arises from the discrepancy between *ex-ante* valuation based on best-guess assumptions and the *ex-poste* valuation based on actuals. This discrepancy is heightened by information asymmetry and problems with contract enforcement but these are not the only issues. When actors interact through organised markets, they do not rely only on impersonal price signals. Market institutions are not merely a set of decentralised price signals for resource allocation decisions or an information exchange mechanism. They offer credible incentives for economic initiatives around products and technologies where the State has an important role to play as an actor (Datta Chaudhuri, 1990). Common property resources can be underused just as badly as they can be overused (Oström, 1990). What prevents this in local habitats is the possibility to efficiently structure equitable solutions without State intervention in the form of Pigouvian levies (Coase, 1960). However, a theory of bounded rationality must incorporate a theory of search (Simon, 1987).

There are two kinds of efficiency effects that have to be envisaged in any valuation model-the static effects propelled by a price-guided system and the dynamic effects that flow from benefit-sharing in innovation (Correa, 2003). Depending on whether traditional knowledge is treated as a pure or impure or mixed public good or club good, the economics of valuation of traditional knowledge would differ. Policies designed to maximise early positive gains from static effects may be counter-productive if they cancel dynamic effects, which ought to be much greater than static effects, if chronology is factored into the calculus. These static and dynamic effects have different time horizons and two orders of static effects and three orders of dynamic effects can be visualised (see Figure 6).

Figure 6 STATIC AND DYNAMIC EFFECTS

STATIC EFFECTS (OPTIMAL INTRODUCTION OF NEW PRODUCTS)		**DYNAMIC EFFECTS (BENEFIT-SHARING IN INNOVATION)**	
FIRST ORDER	IMPACT ON PRICES OF INPUTS	FIRST ORDER	KNOWLEDGE SPILLOVERS
SECOND ORDER	PRIVATE RETURNS FOR KNOWLEDGE SHARING	SECOND ORDER	SUPPLY SIDE ADJUSTMENTS
		THIRD ORDER	EFFECTS OF INCENTIVES
		VERTICAL INTEGRATION OFVALUE CHAIN	PARTICIPATION OF STAKE HOLDERS
PROPERTIES OF CONVEX FUNCTIONS		**PROPERTIES OF CONCAVE FUNCTIONS**	

The first static effects alter the prices of inputs when production expands and resources are allocated and re-allocated for optimal costs. It is well evidenced that prices of plant genetic material in commodified forms rise sharply when the demand for them increases. This has an inter-temporal dependence with the feasibility and time horizon within which a particular plant variety begins to be cultivated in *ex-situ* collections or the active ingredient is synthesised through biotechnology.

The second order static effects appear when private returns for knowledge sharing become extractable in the form of new streams of incomes, employment and profits. The incomes, employment and profits partly reward cultivators of tangibles and a share of

these rewards is appropriated by conduits, brokers, and other intermediaries who function in the market space between the locality of innovation and the *demandeurs.* In such situations, intermediaries have an incentive to be involved with knowledge transfers and with organisation of (or usurpation of) intellectual property rights to such knowledge.

The first dynamic effects begin to flow if and when the form and magnitude of knowledge spillovers can influence demand elasticities for both organic and informational resources. These effects may occur at the same time as second order static effects, or may occur later, or never. They occur immediately when there is sufficient transparency to ignite market signals. They would occur later if supply side adjustments have to be organised with reorganisation and reallocation of resources in the locality. They would appear rapidly if technology transfers-in are necessary for commercial exploitation or if policy interventions ensure creation of or access to new technologies closer to where the knowledge and related plant genetic resources are sourced. But they may never occur if local know-how is quietly and quickly appropriated and *ex-situ* collections organised somewhere else to develop substitutes.

The second–order static effects and the chain of supply-side adjustments induced as second-order dynamic effects feed into incentives for third order dynamic effects. A vertical integration of the value chain is the most likely outcome if raw material supply is the only consideration. Else, a network of participation of traditional knowledge holders may form if access is conditional to the design of benefit-sharing arrangements. If negative externalities of static efficiencies are high during the first two orders of static and dynamic effects, the third order dynamic effects may never arise leading to under-use of resources. If second-order static effects do not require the participation of local knowledge holders, an irreversible vertical integration of the value chain is the most likely outcome with a focus on tangibles, and an incentive to appropriate the know-how for the price of wage labour hours contributed by the intermediaries. The balance between static efficiency considerations and dynamic efficiency considerations is institutionally set in national jurisdictions. The question of designing policy interventions to address this balance is basically about reconciling social interests with private interests.

The availability of *sui generis* protection for traditional knowledge would affect this balance. Deardoff (2000) has shown that a country's welfare increases if its IPR is extendable to another, and also that the other country's welfare decreases. Such a conflict should ideally be addressed either through universally recognised national *' sui generis'* protection for traditional knowledge or through a treaty granting international '*sui generis'* protection to traditional knowledge. The effectiveness of '*sui generis'* protection system would still vary country to country due to differences in characteristics of market structure and national innovation systems.

Since static effects produce short run streams of new income and employment, and the pricing of organic material is propelled by a price-guided system, valuation models tend to assume that the relevant cost curves have properties of convex functions. This assumption is invalidated when agents do not react to impersonal price signals and they anticipate or are guided by the economic logic of discontinuous and increasing returns from new knowledge and innovations. To capture dynamic effects in a valuation model, it is necessary to understand that the assumptions of convexity are useful only for the static effects and that the economics of innovation exhibits increasing returns to scale. Policies aimed at efficient competitive partial equilibrium must take into consideration that the existence of non-convexity in the market for traditional knowledge and plant genetic resources is an intrinsic feature of the dynamic effects arising from indivisibilities in the innovation production process. Preferences of the actors would not satisfy a convexity condition because patents and undisclosed information are antagonistic in consumption[38].

The investment decisions on research and development in drug discovery that guide the dynamic effects are more important than statix effects. The dilemma is that dynamic effects are not be observable at the same location as where the static effects are measurable. For both effects to be taken into consideration, it would be necessary to include in the valuation model all the dynamic effects that can be envisaged through the

[38] *For a theoretical discussion of markets with non-convex preferences, see Arrow and Hahn (1971).*

institution of policies that would make such effects less mobile, away from the location where traditional knowledge and plant genetic resources are originally sourced.

The absence of dynamic effects at locations from where traditional knowledge and plant genetic resources are sourced is attributable to the lack of '*sui generis*' protection for traditional knowledge and plant genetic resources. The problem is aggravated by the availability of incentives for appropriating IPR benefits elsewhere. Contrary to popular perception that cross-border value-chains provide incentives to locate R&D in developing countries with high-skill low wage scientific and technical manpower, core research and development aided by biotechnology (BT) occurs mainly in science parks close to where microorganism depositories exist in conjunction with venture capital partnerships, and is not conducive to being organised like IT[39]. BT, which requires networks of trust and synergy is very different from IT which can be efficiently organised through conduits in virtual space. This may be described as the tragedy of the anti-commons where the absence of ownership pushes traditional knowledge either into the public domain or into underuse or into (mis)appropriation because of impediments to its development unless divorced from its origins.

The absence of particular markets have profound implications for how other markets function and not only the incentives, but also the mechanisms by which information is obtained acquires importance. Stiglitz has shown that discovery of information, a second before someone else, in missing markets can cause financial gains without any economic benefit to society as a whole and that everyone may be worse off, if social costs are incurred in the process (Stiglitz, 2001).

Missing markets are thus about 'incomplete commodification" of goods that cannot be dichotomised into utility or commodity space and that sale and purchase or licensing in such markets call for regulations (Radin,1996). Questions of valuation in such markets cannot be settled from a small set of utilitarian assumptions to quickly establish monetary

[39] *Radner and Stiglitz (1984) demonstrate that it never pays to buy just a little information. For this reason, there is a need to combine convex and concave functions when we value organic and informational resources together.*

equivalence because the goods may be invaluable. The economic use of such resources may involve social decision-making, group decision-making or communal decision-making (Arrow,1997). If market processes select efficient systems of social organisation, the persistent differences observed in the organisation of markets in open capitalist economies and the difficulties of convergence towards international market architecture remain unexplained.

An overarching case for international regimes or national State intervention in preference to reliance on supply and demand in markets exists in cases where pure public goods characteristics derived from the application of science and technology involve questions of standardisation, including standardisation of technologies in the presence of strong network externalities characterised by asymmetric information, bargaining power and resource endowments and where economies of scale significantly impact costs and benefits in the presence of extreme inequality (Mookherjee, 2003). In the instant case concerning TK, all these characteristics are present. Besides, barriers to access involve technologies and plant genetic resources. Solutions to the problem of excludability from innovation need to address both.

Despite claims of benefit-sharing arrangements, there is evidence from the bioprospecting operations of MNCs in the biopharmaceutical sector that the actual flows do not occur. For example, in a case involving the University of California, Davis, the Genetic Resource Recognition Fund set up to source traditional knowledge and plant genetic resources from Mali was unknown in Mali and no one in Mali ever received a cent from it. Payments were made only to Mali technicians in the US who helped transfer the knowhow to the US. In valuation and the design of benefit-sharing arrangements, Coasian solutions are to be favoured over Pigouvian levies because it does matter whether the efficiency gains actually compensate for losses and it is not enough to presume that notional gains are more than calculable losses based on utiltarian measures of welfare. Voluntary agreements cannot govern benefit-sharing arrangements across national borders due to socio-economic heterogentity and incentives to exploit asymmetric information under conditions of weak contract enforceability (Olson, 1965).

Spatial disparities can be aggravated by inter-generational inequities. Future generations are not in a position to transact with current actors. The size and scope of externalities marginalises the weak (in this case, traditional knowledge holders) in distorted and missing markets characterised by asymmetry in contract enforcement capacities of different State and market agents (Greenwald and Stiglitz, 1986). Contracts are also subject to the hazard that similar contracts made by different coalitions are not observable by each other (Mookherjee, 2003). The case for institutional intervention eventually rests on limits to transaction frequency and asset specificity in the presence of uncertainty, and, because ' learning by doing' alters the value of traditional knowledge.

If the epithet ' development round' suffixed to the WTO Doha round is to be more than a cliché, trade related intellectual property rights negotiations ought to embrace an inequality-averse utilitarian perspective. Important untapped resources like traditional knowledge in developing countries require protection for development. Poverty-stricken communities living under abyssmal conditions may be helped in coming out of poverty if they gain formal property rights to TK enable credit and trade with strangers. How these rights are established is important. The burden would be on TK holders if a datebase registry approach is adopted. The responsibility would be on patent applicatns if disclosure for the purpose of patentability required TK to be disclosed. The fact that patents on unauthorised and unpatentable TK have been contested in expensive litigation and revoked is proof that the problem would be better solved in patent offices on the principle that prevention is better than cure.

Policies needed to institute non-negotiable frames as the basis of contracting create market architecture. Forms of enabling/restraining arrangements are not exogenous to markets and trade, but endogenous to them. All markets are social constructions and the global market, despite its special features intermediated by State actors, is no exception. The motivation of MNCs with deep pockets for dominant control of IPR resources in globalising knowledge societies may be viewed as an extension of the kind of control over tangible resources that caused wars in the past. The difference is that in the

twentyfirst century, economic dimensions are of paramount importance, not territory. The quest for international *sui generis* protection for traditional knowledge and plant genetic resources as part of global governance of local spaces is a major challenge in our times. Solutions would have far reaching implications not only for the exploitation of competitiveness but also for the creation of competitively functioning international markets that are governable globally.

9. THE LONG MARCH TO INTERNATIONAL ' *SUI GENERIS* PROTECTION

The protection of TK has strong international dimensions. Policy concerns arise from the appropriation of TK and GR and their reproducibility across borders away from origin. Thus, any national ' sui generis' protection to TK would need to be encased in a system which can interact with IP systems of other countries. The system and its elements need to be characterisable and identifiable at an international level and provide ' national treatment' or reciprocal treatment as a feature. Due to the diversity of objectives such a system would have, it may be difficult to characterise it as an IP system although it would have to be implemented in the context of IPR systems. Moral rights would need to be recognised independent of and alongside economic rights. Biodiversity and TK are a comparative advantage of biorich less developed countries. The lack of IPRs in TK amounts to non-tariff barriers to trade.

The development of international ' *sui generis* protection for traditional knowledge and plant genetic resources was brought into the WIPO agenda in 2001 for the first time with the establishment of an Inter-Governmental Committee on Traditional Knowledge, Plant Genetic Resources and Folklore (IGTKGRF). Countries which are rich in biodiversity have much to gain if an international treaty can be negotiated if it offers the possibility to convert some of their natural wealth into material wealth. However, the WIPO Inter-Governmental Committee on Traditional Knowledge, Plant Genetic Resources and

Folklore has so far failed to produce any consensus for an international treaty. One ' sui generis' system does not seem feasible for all three topics[40].

9.1 Intellectual Property and Genetic Resources

The provisions of CBD provide a logical and convenient starting point if access to and transfer of technology that uses genetic resources is made obligatory. With coordination between WIPO, the CBD Secretariat, the International Undertaking on Plant Genetic Resources, the Secretariat of the Convention on the International Trade in endangered species (CITES), CGIAR, and the Commission on Genetic Resources for food and agriculture at FAO, it should be possible to create models for contractual agreements on access to genetic resources and benefit-sharing. The main constraint is funding the research for capacity building and for operationalising the Bonn Guidelines on Access to Genetic Resources and Benefit-Sharing adopted at the 6th Conference of the Parties in The Hague on April 19, 2002.

9.2 Intellectual Property and Traditional Knowledge

Certain kinds of traditional knowledge are protectable within existing IP regimes in some countries, through patents, with trademarks and service marks, and by geographical indications and copyrights. For instance, the protection of rock-painting images through trademarks and aboriginal secrets under undisclosed information protection in Canada; the use of heritage protection laws to protect the *'Tairona'* appellation in Colombia; livestock-branding as collective marks in Costa Rica; the certificates of origin on food products in Parma, Italy; patent protection on methods of producing camel milk and *kushkon* leather and industrial design protection on carpets, bracelets, yurtas and cradles in Kazhakstan; the *Arte Seri* trademark for the protection of crafts and the Tequila appellation as a geographical indication in Mexico; the establishment of ' Maori made' mark for products from TK in New Zealand; patents on porcelain glaze and the protection of Rostov enamel as an appellation in Russia; and the *Truong Som Balsam* balm

[40] *Some countries introduced the question of folklore into the IGC agenda which complicated an understanding of the problems of traditional knowledge. It took two years of expensive meetings to conclude the obvious, viz. that that TK is different from folklore.*

trademark and the *Phu Quoc* fish soya sauce appellation in Vietnam. An experimental project in Ecuador supported by the Inter-American Development Bank has been able to compile a database of 8000 entries of TK as ' undisclosed information' with a view to structuring benefit sharing (Vogel, 1997).

Conventional IP may be effective in providing protection to individual elements of TK when particular individual elements have separate value. This solution would fail with most of TK which is holistic in nature and where the practical and spiritual elements may be inseparable or where knowledge is in constant evolution and incrementally improving, or where more than one domain of endeavour are involved (for example, artistic, cultural, technical). Conventional IP instruments also fail when creation does not take place through a formal, expressly systematic procedure and the rules governing its creation may be tacit or unknown (see the TK taxonomy in Section 2).

In some cases, TK has been successfully protected under common law or by laws of torts by instituting ' breach of confidence' suits, proving ' lack of prior informed consent and unauthorised use' or wrongful disclosure of undisclosed information in violation of fiduciary duty to a community'[41] . The extent of new rights to be created vary with the subject matter. Consultations with patent offices form a vital link for traditional knowledge to be included for prior art searches because prevention of misappropriation is preferable to costly and time-consuming litigation. This requires new criteria and classifications to be instituted. The introduction of IPC sub-classes A 61K 36100 for TK with approximately 200 sub-groups and sub-classes 35/78, 35/80, 35/82 and 35/84 for medicinal substances derived from plants, are examples of how this can be done. At India' s initiative, the International Patent Classification Union, in cooperation with patent offices of India, China, Japan, EU and US, has developed a new classification tool for TK (see paragraphs 46-50 of WIPO/GRTKF/IC/5/6) and the Health Heritage Test Database contributed by India is accessible at the WIPO portal website.

[41] *See WIPO/GRTKF/IC/3/16 pp2-3, and WIPO/GRTKF/IC/5/INF/2 Annex I pp 2-19 for cases from many countries.*

A worldwide traditional knowledge digital library (TKDL) on the lines of India's TKDL initiative may help but it may also invite plunder similar to what the publication of Vavilov's agro-climating zones caused in agriculture. Significantly, China did not take the step of digitalising knowledge of Chinese systems of medicine. Instead, about 12,000 patents were taken out on Chinese traditional medicine between 1992 and 2000 and several international conferences organised in China. China also actively participated in promoting the Traditional Medicine Strategy of WHO. India was consipicuously absent from this forum during the 1990s and missed the action. It is strange that there is still no cooperating institution from India in the network of WHO traditional medicine resource centres (See http://www.who.org/medicines). Brazil and India belatedly expressed strong reservations at the WIPO IGC on GRTKF about the inadequacy of defensive measures such as registration and digitalisation to protect TK without well established dissemination strategies[42]. The diversity of standards, practices, traditions and differences in the nature and estimable magnitude of stocks of traditional knowledge across the world make the task of achieving convergence and harmonisation cumbersome . The design of one system to suit all countries may or may not be possible but is definitely infeasible at present because the value of TK as a whole has not been estimated for any country, the trade potential is neither assessed nor forecasted, and resources for treating certain kinds of knowledge as a global public good cannot be easily funded. The Patents Coperation Treaty (PCT) provides some safeguards that 'prior art' shall consist of everything made available to the public anywhere in the world by means of written disclosure but this does not help draw the boundary between disclosure for protecting TK and the public domain. Defensive publication strategies such as those followed by Xerox Disclosure Journal, IBM Technical Disclosure Bulletin, Bell Laboratory Records can be relevant only when the date of publication is given, the publication is readily accessible and the disclosure enables others to put the technology into effect.

Nevertheless, WIPO's documentation of national TK protection in a number of countries (see WIPO/GRTKF/IC/5/INF/2 at http://www.wipo.org) and the development of a toolkit for documentation of TK are important first steps towards attempts at global convergence

[42] *See the statements of Brazil and India at the WIPO IGC in WIPO/GRTKF/5/15, July 7-15, 2003.*

on defensive protection. An agreement on a working definition of ' traditional knowledge' needs extensive consultations with holders of traditional knowledge and other stakeholders even to develop a comprehensive taxonomy. Undisclosed registers (not in public domain) can be created for traditional knowledge, nationally and internationally. The proposed definition of TK "*as non-imitative reference of knowledge and practices associated with plants and animals, natural medicine and medicinal treatment*" (see WIPO/GRTKF/IC/9 at http://www.wipo.org) is limiting because it neglects knowledge and practices around human lifestyles and the rest of nature. TK consists largely of innovations, creations and personal, social, and cultural expressions generated or preserved by its present possessor identifiable across a range of fields such as medicine, food and agriculture, environmental management and biodiversity. The process of convergence on uniform terms is less important than the question of recognition of the knowledge as originating in, preserved by and transmitted from traditional contexts. It should suffice if the form of protection is at an affordable level with availability of documentation in six UN languages. International comparisons linking types of TK to types of IPR would be a useful starting point for the design of national as well as international '*sui generis'* systems. The taxonomy presented in Section 2 may be used to operationalise concepts and techniques.

When TK is used as a basis for further patentable innovations, disclosure requirements within patentability criteria and rules about PIC are essential to prevent inappropriate patenting and to facilitate benefit-sharing. The inclusion of TK on the agenda of the current WTO negotiations is the surest way to promote an international model for the legal protection of TK in TRIPS by amending the patentability criteria concerning TK and GR subject matter. The EU had committed itself to this at the Seattle Ministerial in December 1999 but has since retracted from this to keep the matter out of TRIPS and confined to the IGC at WIPO where the slow pace, open-ended, protracted and wide-ranging discussions are a guarantee that nothing concrete can happen for a long time, if ever.

9.3 Intellectual Property and Folklore (traditional cultural expressions)

The term ' folklore' is used widely and features in many IP discussions, model provisions and national laws. For this reason, expert opinion is divided on whether the term should be replaced by the term ' traditional cultural expressions' which some regard as more politically correct. The main policy issues in the international dimensions of protection would be whether to recognise originality or fixation; and rights or compensation, for use privileges. Expressions of folklore are protectable as designs, trademarks and copyrighted material but subject to considerable abuses across linguistic boundaries. ' Originality' in copyright does not have the same meaning as novelty in patent law and the term is defined neither in national laws nor in international treaties such as the Berne Convention. Countries with common law traditions generally require fixation to prove the existence of a work but civil law traditions in Africa, Latin America, Spain, France and Germany do not require fixation. Nordic countries such as Finland have compulsory licensing for literary and artistic works through parastatal organisations like Gramex and Teosto. A standard treatment for performers' rights in different country jurisdictions has not been achieved. Cross-border coordination among arts and crafts guilds is possible but may need to be intermediated by a worldwide organisation organised on democratic principles or through an institution like WIPO.

Seven *' sui generis'* systems have so far been established for the protection of folklore. In chronological order, these are:

1. The Tunis Model Law on Copyright for developing countries, 1976.
2. The WIPO-UNESCO Model Provisions for National Laws on the protection of Expressions of Folklore Against Illegal Exploitation and Other Prejudicial Actions, 1982.
3. The Indian Arts and Crafts Act, 1990 of the U.S.A.
4. The Indigenous People' s Rights Act of the Philippines, 1997.
5. The Bangui Agreement on the Creation of an African Intellectual Property Organization (OAPI), as revised in 1999.

6. The Special Intellectual Property Regime Governing the Collective Rights of Indigenous Peoples for the Protection and Defence of their Cultural Identity and their Traditional Knowledge of Panama, 2000 and the related Executive Decree, 2001
7. The Pacific Regional Framework for the protection of Traditional Knowledge and Expressions of Culture, 2002.

Common to these is the notion that customary laws are a living heritage that can be connected to the IP framework. Folklore is accorded a special (*' sui generis'*) type of copyright protection because there may not be any identifiable copyright holders or they may involve dynamic interplay between collective and individual creativity or it may simply be undesirable to assign copyright because significance and worth is derived from community recognition and identity and is not an individual' s mark of originality like lyrics, fables, designs, motifs, formulas, song notes etc. The coverage is extended also to ' works inspired by folklore' in many, but not all cases. These systems explicitly recognise that TCEs/folklore may carry spiritual and religious meanings that carry beliefs and values and perform cultural, social or spiritual functions linked to activities such as initiation, hunting, fishing, birth, marriage, death or have decorative purposes.

Distinguishing between protectable expressions and public domain is particularly problematic in the case of folklore because it does not belong to a category where the term of an IP protection can be said to have run out by some specified efflux of time nor can it be considered to have been forfeited before it has ever been claimed. Merely because something is publicly available does not mean that it belongs to the public domain (an analogy would be copyrightability of material available on the world wide web) but at the same time it remains distinct from ´prior art' notion of patent law. Six of the seven *' sui generis'* systems in vogue do not require originality to be proven nor fixation as condition precedent (the exception is Panama). Documentation, registries, lists and inventories have a very limited role to play in '*sui generis'* protection of folklore.
The treaty discussions at WIPO collapsed in July 2003 for a number of reasons. Very few countries actually responded to the WIPO questionnaires and the facts collected did not provide a representative or comprehensive picture of the state of GRTKF in the world.

The focus of the IGC remained on discussions and information gathering. The IGC couldnt agree on the need to negotiate a legally binding treaty or even establish a mandate for an international treaty framework within an achievable timeframe. Much time and money was wasted over who should participate, and ironically, on how such participation could be financed. There was hardly any discussion on institutions and processes that would be needed for capacity building as if definitions of "traditional cultural expressions" and a tool-kit questionnaire created by the IGC would liberate TK holders from exploitation. The IGC discussed defensive documentation of articulable knowledge and provided information on ABS contracts and how laws of different countries protect TKGRF. In two years of functioning, the IGC did not hold any issue-based or specific topic based discussions to reach agreements among the parties. Neither did it create any working groups or expert groups from among the parties represented with a view to reach any agreements or consensus on anything. The African Group proposed a time-bound mandate on a binding treaty clearly including commitments on the form of work needed for it that corresponds with the need to establish comprehensive global protection in conjunction with other international organisations. Even this minimal proposal could not be agreed by the parties. The mandate of the WIPO IGC has since been extended until 2005 but it is too early to know whether a consensus for an international treaty will coagulate[43].

For now, the international consensus on sui generis protection for traditional knowledge, genetic resources and folklore eludes us. The absence of a coordinating mechanism like G-7, OECD, EU or G-77, the diversity in legal systems and IPR laws, the divisive scramble for FDI and the effective use of bilateralism, regionalism, plurilateralism in a monopolar world order are some of the reasons why international '*sui generis'* protection for traditional knowledge is unlikely anytime soon. The failure to substantively harmonise patent laws at WIPO and the compromise to harmonise only patent office procedures in the Patent Law Treaty, 2000 does not augur well for international cooperation on IPRs.

[43] *WIPO Committees are known to be valuable in clarifying many issues but often fail to reach any consensus. The failure of the WIPO Committee on the patentability of biotechnology inventions to reach*

10. FEASIBILITY OF NATIONAL '*SUI GENERIS*' PROTECTION

10.1 The building blocks

The authorisation of access to traditional knowledge and the structuring of benefit-sharing arrangements are the two keys to unlock the potential for development and trade based on traditional knowledge. Innovation is the dominant activity in our times and any source of knowledge that leads to innovations has value in the market place. Knowledge based innovations are usually not produced from a single resource. The combination of resources required is also not necessarily available everywhere. Models of innovation vary and are strongly influenced by the jurisdiction in which innovations develop, the people and organisations that participate in processes and the incentives for innovation. The stickiness of information is not necessarily man-made. Certain kinds of information can only be generated in specific natural or technological environments. Agents in missing markets often act strategically because no equilibrium condition is satisfied. This is typically the case when contingent and futures markets are missing. Thus, the visible hand of policy makers and other actors is more important than the invisible hand of the market. Markets are only one kind of institutional mechanism. In missing markets the first thing to check is how agents presently conduct non-market transactions and how they connect them with market transactions.

The insistence of formal IPR systems that only knowledge in codified forms is protectable to be assetised works against the nature and values by which traditional knowledge is held and cared. Bonds of communion may dilute in a community causing erosion in social capital if expression as the media for categorisation of experiences and insights dominates for the sole purpose of organising the material and social world. When such knowledge complements existing knowledge in formal domains, the positive spillovers have considerable value. The marginal costs and benefits of individuals need to be aligned with those of society as a whole. The creation and administration of community funds is highly desirable to enable benefit-sharing to be realised. Investments in biotechnology close to the locations where biological and genetic material is sourced

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any consensus after four years of work between 1984 to 1988 preceded TRIPS.

can enable host country scientists to participate actively in promoting innovations and competing in the market for innovations.

10.2 Essential elements of a national '*sui generis'* framework

First of all, any national ' sui generis' protection framework for TK must ennunciate policy objectives of the intended protection, clearly define what is to be covered, the criteria to be satisfied for coverage, specify rights and the terms and conditions for the exercise of such rights. It would be necessary to state how and when rights arise, what would obligate the recognition of such rights, how the rights would be administered, enforced, transferred and acquired, and if and how they may be extinguished.

If assignment of ownership is impossible or undesirable, operationalisable concepts of custodianship, stewardship and trusteeship have to be created. Positive protection needs to be distinguished from defensive measures and specific *' sui generis'* rights related to TK need to be constructed rather than organizing only for limited protection through *' sui generis'* elements in conventional IP systems or general reinforcement of non-IP laws.

'*Sui generis'* protection would involve linking many forms of TK, drawing upon a range of national and international laws and all the elements would have to be coherently organised in a system to avoid leakages. For this reason, it would be more appropriate to speak of a national '*sui generis'* protection system, than be satisfied with a limited legal notion of national '*sui generis'* protection. Such a system may need to depart from rigid IP notions to accommodate the special characteristics of TK subject-matter and the particular policy needs that require such a system to be created. It cannot be formulated on the *' lex loci'* principle alone because portability of rights in knowledge would be one of the main objectives of such protection. The system cannot also rely on protecting TK aspects in fragments because TK is not the mere sum of its separable components, being indivisible knowledge embedded in its context with an equal claim to knowledge as any other knowledge, following the UNESCO declaration on plurality of knowledge traditions. With this preamble in view, a national '*sui generis'* framework would have to envisage the following aspects:

1. Many objectives of TK protection need to be simultaneously pursued. Protecting against third party rights of IP claims over TK subject matter is only one of them. TK also has to be protected against unauthorised disclosure or use to protect TK-based commercial products and services. Culturally inappropriate or offensive use of TK material, licensing and controlling the use of TK-related cultural expressions and licensing aspects of TK for use in third party commercial products would be regulated. A clear, transparent, enforceable system would provide legal security, predictability, and accessibility. The protection can apply to the content, substance or ideas embedded in praxis corresponding roughly to the subject matter of patents, utility models and know-how or trade secrets; or to the form, expression or representation of cultures and communities roughly corresponding to copyright and performers' rights and rights in industrial and textile designs; or to the reputation and distinctive character of signs, symbols, indications, patterns and styles corresponding roughly to the subject matter of trademarks and geographical indications as well as for names, hallmarks and national symbols. It should be possible to accord protection to TK as an indivisible whole embedded in praxis, without requiring that parts of it that correspond to known IP forms be protected separately from a residual under a *' sui generis'* system. The choice of menu should be left to the intended beneficiaries, the TK holders on the principle that help is best defined by recipients in all helping relationships.

2. The system must be designed to be robustly inclusive in coverage to cater to the whole range of the taxonomy developed in Section 2 and flexible enough to enable a range of contractable solutions around essential pivots of access and benefit-sharing (ABS). An attempt at an exhaustive definition or to a notion of specified antiquity must be avoided.The pertinent criteria for coverage would be to protect TK generated, preserved and transmitted in traditional contexts. Due to overemphasis on abstract content often to the neglect of its spatial context and temporal dimension in certain

traditions[44], care must be taken to explicitly cover skills, innovations, insights, experiential learning and justified beliefs with due respect to social capital, norms, values and traditions. At the same time, norms, values and attitudes need not be elevated to form an intrinsic part of TK because that would create non-transparent circumstances in which social and professional hierachies may obstruct knowledge transfers. Links in a community can be constructed through rights and also though responsibilities. Therefore, alongside ownership, the notions of custodianship, stewardship and trusteeship must be recognised and rewarded. For instance, the TK rights of Scheduled Tribes in India would be more safely protectable were India to ratify ILO Convention 169 and incorporate its provisions into local governance.

3. It would be particularly useful to distinguish TK from folklore. If a single solution does not fit all categories, a blend of several alternatives and combinations must be allowed. This approach has worked in Mexico where '*sui generis'* protection for TK is being constructed alongside trademarks laws and industrial property laws for crafts. Brazil, Panama, Peru, Portugal, Kenya and Philippines have incorporated provisions linking traditional knowledge to the identity of their indigenous populations.This way, they circumvented the tendency in some countries to attempt to bring all TK under a parastatal national organisation - a flawed solution that first robs the people and then encashes on the robbery. The Peruvian law, for instance, are particularly noteworthy because they cater for TK rights in perpetuity (in Portugal the limit is 50 years) and explicitly recognise collectively held knowledge. Kenya has taken the commercial route to encourage *ex-situ* collections of genetic resources in exchange for cash from biopharmaceutical firms. Countries like Brazil, Peru, Mexico, India and China should stay away from this precedent because these countries have a lot of biodiversity and also the scientific personnel to develop the biotechnology industry.

4. The resulting solutions must not be contrary to internationally accepted rules and norms of intellectual property rights protection. The system must complement and

[44] *Pulin Garg called this the ' Aristotlisation of knowledge' because Greeks of Aristotle's times canonized precepts based on abstract logic of thinking without the burden of empirical verification since they couldn't tell the time of the day and were also clueless about where on earth they were located.*

supplement existing regimes otherwise the *sui generis* system would not be an IP system at all. The Peruvian law, for instance, makes a virtue of referring to a decision of the Commission of the Cartagena Agreement as its inspiration for the definition of "collective knowledge" (Decision 391) Competition in the market for innovations and their products and services must be ensured and unfair practices checked. Investigating a wrong claim to inventiveness would not suffice. There should be a provision also to assess how and to what extent it damages others' interests. This feature would be particularly useful in international disputes because the law of torts varies country to country and any *' ab initio void*pronouncements in common law countries would need to be harmonised with compensatory practices not based on specific relief for damage claims in code law countries. Concepts of unfair practices, unjust enrichment, misappropriation of reputation or goodwill drawn from general jurisprudence can be adapted to TK in the new legislation for protection of traditional knowledge.

5. Legislation establishing *sui generis* regimes now exists in some countries. Other countries like India should generously cooperate with these countries to learn from their successes and also their mistakes[45]. These countries are Brazil (Provisional Measure No. 2.186-16 of August 23, 2001), Panama (Law No. 20 of June 26, 2000 read with Executive Decree No. 20 Of March 20, 2001), Peru (Law No. 27811 of August 10, 2002) and Portugal (Decree-Law No.118/2002 of April 20, 2002). A basic feature of these early national *sui generis* regimes is the recognition of rights of indigenous and local communities to decide on the use of their traditional knowledge and genetic heritage, and regulations on the rights of foreigners and foreign legal entities, with incentives for bioprospectors who transfer technology. In some cases, as in Panama, collective rights to artefacts, art forms, crafts and expressions of culture are explicitly specified and can be registered. Prior Informed Consent in the Peruvian law means authorisation given by TK holders, not government.

[45] *See WIPO/GRTKF/IC/5/INF/2 dated April 4, 2003 at http://www.wipo.org*

6. To render valuation useful, 'biological resources' can be defined to mean "*genetic resources, organisms or parts thereof, populations or any other kind of biotic component of ecosystems that are of real or potential value or use to mankind*" (underlining mine). This would take care of some of the valuation problems discussed in Sections 7 and 8 of this study. A new legislation would have to be introduced to authorise functional modalities for access to traditional knowledge and plant genetic resources under contractual benefit-sharing arrangements within the framework of local governance institutions and not as an another structure of bureaucracy. India's Biological Diversity Act, 2002 (Section 36.4) states the need to develop *sui generis* protection for traditional knowledge. Essential features of such a law would be measures to facilitate contractual arrangements that are fair and reasonable through creation of publicly accessible information networks and freely available expertise and to outlaw the role of rent-seeking intermediaries.

7. The new arrangements, including new institutionalities created must be process-driven without pre-determination of umbrella ownership of the domain of traditional knowledge itself. The approach should be to act with TK holders, rather than upon them. They must be involved and enabled to participate at the earliest stages of ABS structuring. The WIPO toolkit to document TK is a useful instrument to convert tacit knowledge to articulable knowledge and can be widely disseminated for use in cases where documentation would constitute a condition precedent to registration. However, the tool-kit must not be used in all cases because there would be instances where codification may be ruinous to a trade secret. TK holders will need to be educated and cautioned as part of capacity building. A manual of use can be prepared and widely circulated to promote awareness of international differences in the scope, coverage and standards on comparable issues so that risks are easily noticed by those involved in structuring benefit-sharing arrangements. For example, US, Australia, Hungary, Japan and New Zealand allow plant parts to be patented whereas Netherlands, Norway and Canada do not. The EU does not cover plant groups characterised by a particular gene under plant varieties protection making it eligible for patenting. The US laws are not TRIPS compliant in the case of undisclosed

information. The system must provide for recording the country of destination and names of transferees in all cases of biological and genetic material transfers.

8. The system must cater for registration of traditional knowledge in local governance jurisdictions without limiting the protection to knowledge so registered. Protection can apply to TK as an object, to the social and cultural context in which TK is developed and maintained, and to the distinctive forms, mechanisms and expressions by which it is communicated and transferred. Specific rights in TK must aim at conferring IPR protection to restrain others from using TK without authorisation. While a broad definition of TK is useful to define its scope, specification in narrower terms is necessary to confer IPR protection. ABS is likely to involve licensing as well as partnerships and contracting. TK has to be recognised, respected, preserved and maintained and its applications have to be promoted in ways that the utilisation leads to equitable sharing in its benefits. The right of TK holders to say 'No' to utilisation is a contentious issue because it is against the IP principle of disclosure for ABS, but some countries have allowed it. A sharp division between conventional IP mechanisms relevant to TK protection and distinct *sui generis* systems cannot be made. Many countries have provisions for protecting TK in conventional IP laws[46]. Alongside distinct *sui generis* systems for TK, there can be *sui generis* elements of other IP laws relevant to TK (like the Budapest Treaty). Distinct classes or sub-classes in patent classifications could also be characterised as *sui generis,* paving the way for International Patent Classification to incorporate these on grounds that policy interest in IP protection of TK has a strong international dimension. Putting a law in place would not suffice as it could lead to ambiguities in construction. To cater to legal certainty for traditional knowledge holders, a *sui generis* system (not only *sui generis* protection in a technical sense) needs to be conceived to encourage innovations based on local knowledge. The standards of novelty should be pre-specified for all the various categories of traditional knowledge in the taxonomy proposed. It may be useful to introduce notions of ' technical novelty' (as in Peru) and ' commercial novelty' (as in Portugal) for TK in the public domain or private databases

[46] *See WIPO/GRTKF/IC/5/8 dated April 28, 2003 at http//www.wipo.org , pp.30-31.*

on the date the new law takes effect. That would enable restoration/compensation to be structured in deserving cases.

9. The framework can allow individual and/or collective rights without any limitation in time or expiry date. Co-ownership or part-ownership of rights can be enabled. The rationale has to consider that unlike other IP rights, TK rights are integral to a community's life and heritage. IP rights need not impact how TK is created. A crucial mandatory requirement of the system should be a statutory obligation for disclosure of origin and provisions for prior informed consent before traditional knowledge or genetic resources or local innovations are traded or commercially exploited with protection as a form of intellectual property. The rights should be vested in TK holders, not in makers of databases, inventories or websites.

10. The legal protection treated as '*sui generis'* should be *pari passu* with all international treaties including but not limited to TRIPS, invoking the Shylockian dictum that not a drop of blood should spill from any international commitment or mandate to which the country is a party or signatory. *Sui generis* protection need not be regarded as a measure of additional protection or as a utility model under the Paris Convention. Such protection should automatically be available without requiring any formality as done in the African Model Legislation (Article 23.3) and the Costa Rican Law (Article 82). Registration should be encouraged as a means of justiciable enforcement of TK rights under fast-track procedures. Thus, the distinction between two levels of protection would not require every TK to be inventorised but there would be an incentive for industrial/commercial applications to be disclosed and registered.

11. The law should specify only the non-negotiable frame that sets the boundary conditions for benefit sharing and provide models for contract enforcement without the government getting involved as a judge, arbitrator, executor or overseer. The invitation to participate in complex unwieldy bureaucratic structures would be a poor consolation if it were to be substituted for freedom of opportunity. Coalition models can be more predatory than the rent-seeking behaviour of a single party community

group. The solution would be to recognise collective rights as well as individual rights. Concepts of custodianship, trusteeship and stewardship must be incorporated alongside ownership. Any impairment, infringement, impediment or detriment to the status of traditional knowledge holders, before, during and after determination of rights may also be regarded as a compromise of human rights and rights to development. The law must cater also for agreements between different communities for consolidation, collaboration, consultation and cooperation. Researchers' rights and obligations would separately require to be specified in the laws.

12. A national fund for the development of TK can be created on the lines of the biodiversity fund, supplemented by national and regional innovation funds together with a development and annual evaluation mechanism linked to search for partnerships,venture capital sources, and technical assistance to widely disseminate success cases as models in every district of the country, particularly in tribal areas and rural areas[47].

13. In the TRIPS Council's review of IPR laws and regulations of 33 countries, developed country surveys were reported IPR by IPR whereas developing country reviews were conducted country by country. It would be desirable to cross-reference existing IPR laws in the new proposed legislation for traditional knowledge, particularly the Patent Act (as amended), Plant Varieties Protection Act and the National Biodiversity Act. In the Indian case, the last mentioned law independently provides for revocation of patents (Section 18.4), equitable sharing (Section 21.2), prior informed consent (Section 6) and a National Biodiversity Fund (Section 21.3) whereas the Patent Act excludes traditional knowledge from patentability (Section 3 (p)) and "articles or substances based on the system of Indian medicine" under Section 2 (1) (e) of the Indian Medicine Central Council Act are also excluded from patentability.

[47] *In the case of India, the involvement of the World Wildlife Fund and wide dissemination of the genetic resource potential identified by them in their studies and other surveys by the government should be made available in all 36 endemic zones and not only in the two biodiversity hotspots of the Western Ghats and the Eastern Himalayas.*

14. The rights to compensation should expansively prevail over exclusion in disputed cases with quasi-judicial determination by local self-government (for example, *panchayats*) assisted by a panel of experts. Royalties on products developed by the use of proprietary research tools and techniques by knowledge providers and knowledge developers would require careful handling. The law can cater to rights for ' communities' , where communities can be defined as a group of people inhabiting a proximate natural environment-regardless of whether the group is formal or informal, organised or disorganised, united or fragmented, monolithic or reticulate-as long as it shares knowledge tradition (s) and has a shared purpose or common interest in the protection and development of traditional knowledge located within its control.

15. A nationally instituted *sui generis* system would have limited utility without continuing effective international representation for access to technologies as envisaged in CBD's toothless provisions or patent law harmonisation, particularly on questions of novelty, prior art searches, international enforcement of regimes for transfer of biological material deposits, reversal of proof for new medicinal patents that contain ingredients used in traditional medicine, and the search for a proper definition of unpatentable discoveries. A TK rights holder would have no security for her rights in another national jurisdiction unless a system of reciprocal recognition is instituted or until a multilateral treaty makes this possible. The national system must address the question of cross-border transfer of rights in any case if ABS is to be operationalised. The question of standards, which has a bearing on reputation would be one of the considerations, besides known moral hazards.

16. Budgetary allocations for capacity building among traditional knowledge holders and for biotechnology will need to be significantly improved for a *sui generis* system to succeed on a nation-wide scale. In India, 8.6 percent of the population is classified as "tribal" according to the population census of 2001. Thus at least 89 million people, at a minimal estimate, live in proximate natural environments where traditional

knowledge and plant genetic resources abound[48]. According to the Tenth Plan Document (2002-2007), in pursuance of Article 275 (1) of India's Constitution, a grand annual sum of Rs 300 crores (about $ 6 million) is allocated to promote tribal participation in forest-centred activities and ensure tribal participation in the development process. This works out to Rupees 3 (about Euro 0.06) per tribal per month. For practical purposes this is the amount that can be regarded as the incentive for protection of biodiversity and traditional knowledge in tribal areas. The amount is lower than the statutory minimum wage and grossly insufficient. This keeps tribals as nomadic dependents enslaved under the forest department. In contrast, there is considerable money allocated to elitist institutions in cities to promote local grassroots innovation, which showcase India's great advances in this area abroad.

In the case of the much applauded medicinal innovation 'Jeevani', the product is marketed but still under-supplied (Gupta, 2002). The Kani tribe who cared for and fed the idea were initially denied cultivation rights on the specious plea that the *arogyapachha* plant was not classified as 'minor forest produce' by the forest department. The Kani tribe did not have access to a telephone to seek help to lodge a complaint. The Japanese offered to buy the DNA rights to the plant for Rs 100 million. Eventually, the Kani Samudaya Kshema Trust was set up which licensed the manufacture in a partnership with the Tropical Botantical Garden Research Institute. Only one out of 12 active compounds could be developed from five that were isolated with available Indian technology at TBGRI. Four more were isolated in Denmark after the involvement of DANIDA. There was also considerable plucking of the whole plant (although only fruits and leaves were needed to produce particular therapeutic drugs) and the price rose from zero to over Rupees 100 per Kg. All the problems of static and dynamic efficiency discussed in Section 8 were observable in this case, providing empirical support to the valuation model proposed in this study.

[48] *In Sri Lanka, the Veddas or Wanniyalaeto have inhabited forests for more than 16,000 years. They were evicted to be drawn into the "mainstream" and their land was turned into Maduru Oga National Park. This destruction to their habitat, biodiversity and traditional knowledge has proved irrepairable when attempts to rehabilitate them are now part of official policy.*

17. Communication and credibility are the two corner stones for ABS to thrive and the system has to be enforceable at an affordable cost. Benefit-sharing schemes are capable of producing convoluted outcomes if there are too many parties to a transaction. The problems experienced in structuring ABS in Mali, Nigeria, Philippines have lessons for all developing countries (Gupta, 2002). The early experience gained from the work of UNEP and the CBD secretariat and problems encountered in administering local innovation networks funded by the Department of Science and Technology in India should be noted to avoid pitfalls.

18. Scientific hubs of ethnobiology should be involved in training and providing expertise in biodiversity hotspots to local communities as part of capacity building[49]. The linkage between formal systems and informal systems is of profound significance in accelarating the innovation cycle (Mashelkar, 2001). It is important also for exports because Indian medicinal products can face non-tariff barriers and the government recognition of Ayurveda in 1995 came very late (Gautam, 2002).

19. There is a need for dedicated autonomous non-govermental public institutions to function as national and regional clearing-houses and bridging institutions. If this were to be done for all the various categories of traditional knowledge, a better understanding would develop of how such knowledge can be preserved, developed, traded with reference to the needs and opportunities of knowledge holders and their partners and customers. These could be begun with seed capital from the State and become self-financing in the long run when they are able to inspire confidence of people willing to pay for services including but not limited to search services, expertise and documentation. A national educational and research institution dedicated to traditional knowledge and capacity building can complement the activities of public institutions visualised above. This would promote cross-

[49] *The Regional Research Laboratory, Jammu has vast knowledge of over 9,500 medicinal plants and over 6,500 other useful plants. Traditional medicinal knowledge is not the only form of traditional knowledge. In every category of traditional knowledge, similar institutions have to be identified or created to assist local communities in developing traditional knowledge. For example, the technical support of UNIDO to artisanal clusters in Rajasthan can be developed to serve as a model for arts and crafts throughout the Country.*

fertilisation of knowledge and experience gained across arts, crafts, life sciences and other sciences, and technologies and enhance pattern recognition skills of the society as a whole which could bring forth many new surprise accretions to the world of knowledge.

20. Benefit-sharing arrangements must be contracted at as early a stage as possible and as close to the point of access as feasible. To get away from divisive and exclusive rights to resources that are the subject matter of access, it should be permissible to substitute non-material compensation (such as education, or technical knowhow to exploit plausible local innovations) for cash to some extent, provided the TK holders remain included in further sharing at different stages of development of the resource in the process of 'learning by doing'. In the ideal case, stakeholders should be part of the subsequent decision-frames. Finally, benefit-sharing arrangements must incorporate biodiversity conservation goals.

CONCLUSIONS

Traditional knowledge is a vast treasure trove for resourcing and developing patentable innovations. The interest in *sui generis* systems-national and international, for protection of TK is a public policy objective that reflects the needs and expectations of communities, particularly traditional knowledge holders. In IPRs, claims for international protection are considered only when national protection exists. The quest for protecting traditional knowledge within the cultures of knowledge traditions bound to IPR systems, as presently developed, is a futile search for a "procrustean bed for an ameboid phenomena" (Viswanathan, 2001). There is no reason to regard a functioning IPR frame as more perfect than one that mirrors a natural process or approximates a synthetic repository for a real flower or butterfly. IPR concepts are useful to describe the innovation tree but there is no reason to mistake concepts for the tree itself. Specification through documentation in a discrete representation can detract from and deny or devalue living processes. The pursuit of validity, standardisation, universalisation, uniqueness,

authenticity and historicity are features of IPR regimes. If TK could be adapted to them, there would be no need to ponder over missing markets. The struggles for and against commodification are essentially about acquiring new IPRs. Biopiracy and piracy of traditional knowledge is a global public bad. This may be mitigated if international cooperation replaces the paradigm of 'external affairs' with policy-making to internalise externalities at source by recognising and provisioning 'global public goods'.

The recognition of traditional knowledge as a global public good may someday enable an international *sui generis* system to be operationalised. However, that would need the Convention on Biodiversity and TRIPS to be harmonised to enable WIPO, UNESCO, UNIDO, UNEP, FAO, WORLD BANK, WHO and UNDP to facilitate processes that may otherwise conflict with WTO. An international treaty providing 'sui generis' protection to traditional knowledge can be reached through WIPO or UNESCO or WTO but the immediate prospects of doing so are fraught with considerable difficulties.

The UNDP has identified three reasons for pessimism. Firstly, policy-making is still national, although many challenges are global causing a 'jurisdictional gap'. Reciprocal bilateralism or plurilateralism are either not feasible nor effective as options in missing markets. Secondly, international cooperation is predominantly inter-governmental despite the emergence of other global actors who participate at the fringes (as in the case of NGOs at world summits and at the IGC on TKGRF at WIPO) creating a 'participation gap'. It seems difficult to finance the participation of stakeholders .Thirdly, the important aspects of international cooperation are no longer trade issues at borders but investment and behind-the-border issues, whose implementation on the operational side relies exclusively on dwindling aid mechanisms resulting in an 'incentive gap'. Public goods like technological knowhow remain overpriced while other public goods like traditional knowledge and plant genetic resources remain underpriced.

Countries need not wait for an international treaty on TK. National 'sui generis' protection systems can be designed to suit national priorities. Such a '*sui generis'* system would not be achieved merely by digitalisation of traditional knowledge although that

may be useful as a limited defensive measure. Nor would it be useful for governments to step into missing markets by creating new bureaucratic authorities with discretionary authority as overlords of traditional knowledge and genetic resources. For access regimes and benefit-sharing arrangements to work, governments should concentrate on establishing frameworks and limit their role to capacity building, facilitating information flows, promoting new forms of contracts enforcement, benefit-sharing norms and effective international representation. The last of these requires remedies to be negotiated so that jurisdictional gaps involving questions of territorial applicability such as the invocation of 'public order' clause are speedily resolved and agreements to facilitate non-corporate transfers of biotechnology take effect. Since legitimate national measures that take away the benefits of patents can be challenged under non-violation type complaints, clarity is also needed on whether such challenges would apply to TRIPS.

Coalition models are a popular inclusive form for many kinds of joint enterprises but these can be more predatory than rent-seeking by a single group. Strengthening local governance *panchayati raj* institutions in rural and tribal areas would be an important pre-requisite to build confidence at the local level for access and benefit-sharing contracts. Article 8 of CBD is silent on the rights of communities and cultivators. Countries have a right to legislate on community rights. Governments must discard the notion that traditional knowledge belongs to the government and function as a representative trustee of people and nature[50]. A Shylockian approach insisting that compliance with TRIPS cannot mean the defiance or abrogation of other international mandates and treaties would be useful to place TRIPS alongside other priorities and international commitments without violating TRIPS. A balance of rights, responsibilities and rewards should be the ultimate goal.

[50] *Developing country governments find it hard to resist the colonial strategy by which all non-urban space was regarded as Terra Nullius to be discovered, claimed and appropriated in the name of the State.*

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